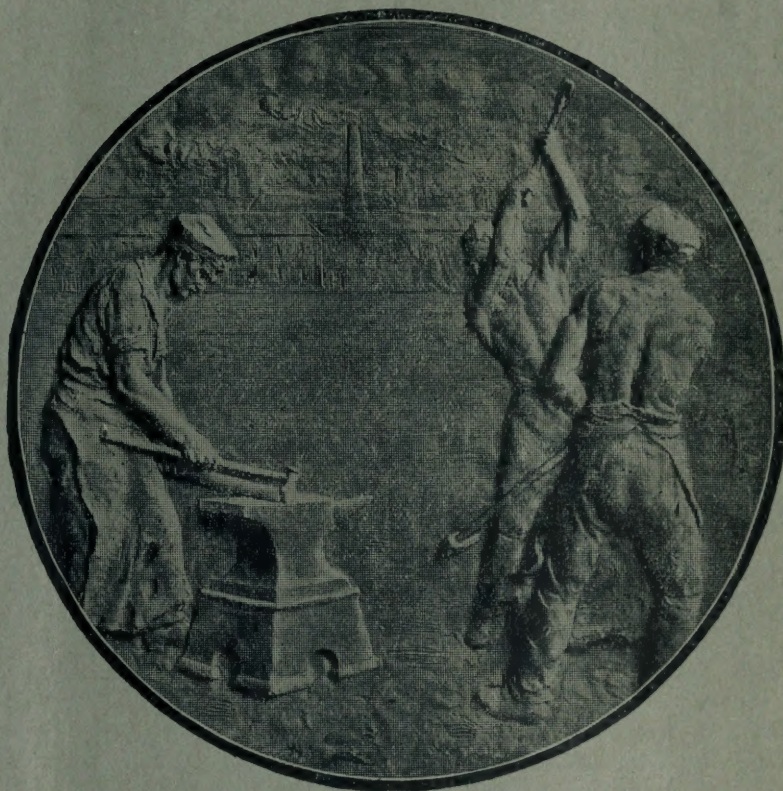
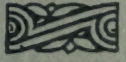


PAGE'S WEEKLY



ENGINEERING · ELECTRICITY
SHIPBUILDING  MINING
IRON & STEEL INDUSTRIES

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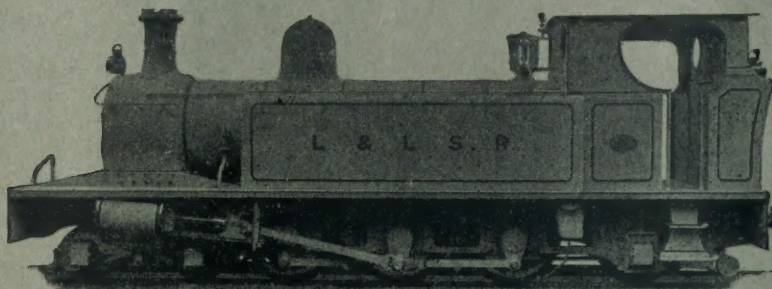
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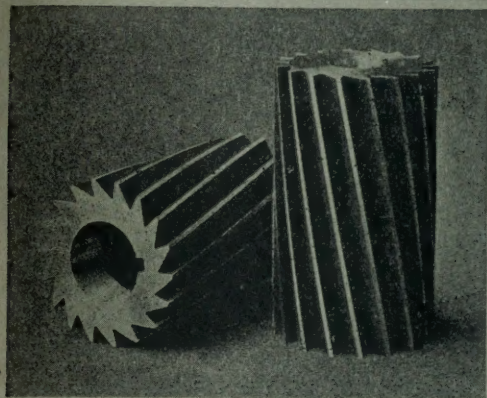
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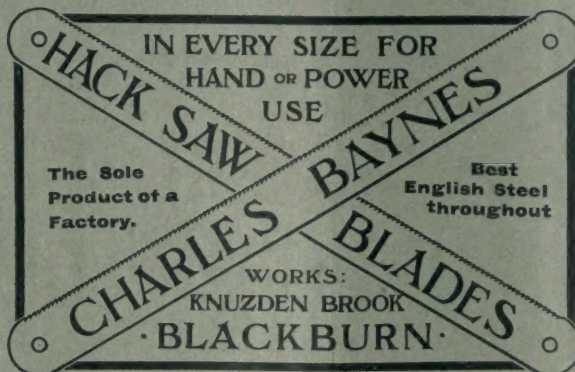
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PAGE'S WEEKLY

Miscellaneous

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Write for particulars.

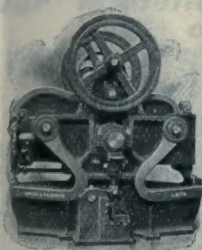
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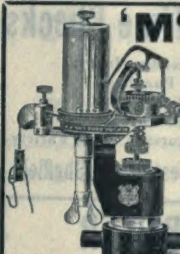
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Each made in several forms and sizes
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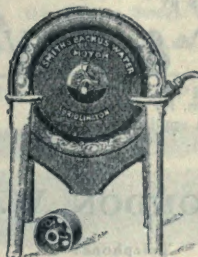
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Will drive any class of Machinery, and
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PATENT WATER-TUBE BOILERS,

These Boilers are in use throughout the world to the extent of 4,700,000 h.p.
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See our Advertisement appearing Aug. 4th. page 37.

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Miscellaneous

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FORGING PLANT.

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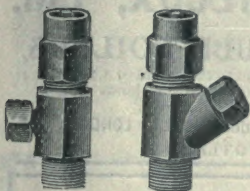
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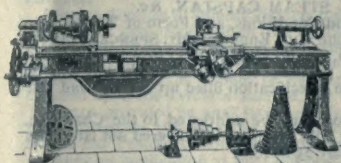
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Miscellaneous

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Catalogue and Half-Tone Printers,
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See our Advertisements in last and next week's Issues.

TRANSPORTERS.

See our Advertisement appearing Aug. 4th.

TEMPERLEY TRANSPORTER CO.,
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Telephone: 365 London Wall.

Telegrams: "Transumo."

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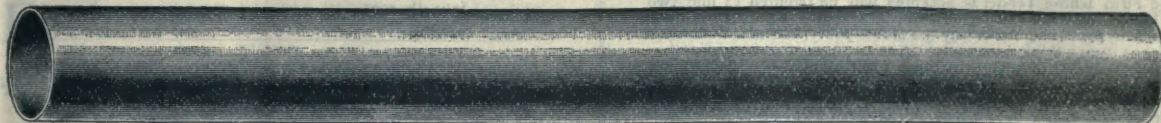
London Office—

114, Tooley Street, S.E.

Glasgow Office—

104, Bath Street.

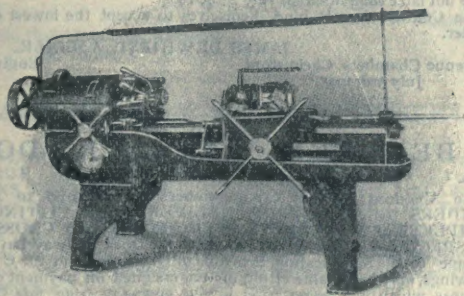
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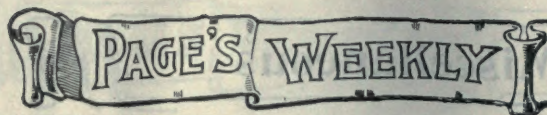
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**Air Compressing Machinery
FOR ALL SERVICES.**

HUGHES & LANCASTER

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Contracts

CONTRACTS.

MERTHYR TYDFIL URBAN DISTRICT COUNCIL.

REFUSE DESTRUCTOR PLANT.

The Council invite TENDERS from experienced makers of Refuse Destructor Plant for the ERECTION of PLANT capable of effectually burning 120 tons of refuse per day, together with all buildings and contingent works connected therewith.

The Council have selected three alternative sites, and copies of the site plans, together with "General Conditions and Particulars for the guidance of Contractors tendering," may be obtained upon application to T. FLETCHER HARVEY, Esq., Engineer and Surveyor to the Council, upon payment of a fee of £3 3s., which will be returned upon receipt of a *bona fide* Tender.

The Council do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Destructor Plant," must be delivered to T. Aneuryn Rees, Esq., Clerk to the Council, on or before September 1st, 1905.

T. FLETCHER HARVEY,

Engineer and Surveyor to the Council.

Town Hall, Merthyr Tydfil,
June 16th, 1905.

MUNICIPAL BOARD OF MUSSOORIE, INDIA.

ELECTRIC LIGHTING AND WATER WORKS SCHEME.

The Municipal Board of Mussoorie, India, is prepared to receive

TENDERS FOR THE SUPPLY, DELIVERY, and ERECTION at sites, in complete working order, of the following plant:—

(a) Steel Power Pipes; (b) Water Motors; (c) Alternators with Exciters; (d) Switchboards with Instruments and Apparatus; (e) Transformers; (f) Induction Motors; (g) Pumps; (h) Workshop Machines.

Also for the SUPPLY and DELIVERY of the following:—

(a) B re Copper Wire for Overhead Mains; (b) Insulators and Lightning Arresters; (c) Arc and Incandescent Lamps; (d) Telephone Equipment; (e) Workshop Tools; (f) General Stores.

Specifications, Form of Tender, and General Conditions can be obtained on application to the undersigned on payment of a deposit of Rs. 75 (£5), which amount will be returned on receipt of a *bona fide* Tender. Additional copies may be obtained on payment of a further fee of Rs. 5 (6s. 8d.) per set, which will not be returned.

The Firm whose Tender is accepted will be required to find two sureties to the satisfaction of the Municipality, and to enter with them into a contract to be prepared by the Municipality, and to contain such clauses as it may think necessary.

Sealed Tenders, on the prescribed form, endorsed "Tender for Electric Lighting and Water Works Scheme," should be addressed to the Chairman, Municipal Board, Mussoorie, India, and must be delivered to him on or before Monday, October 23rd, 1905.

The Municipality does not bind itself to accept the lowest or any Tender, nor will it consider any Tender that is not for the whole of the Plant and Material.

By order,

C. H. SHANAN,

Assoc. M.Inst.C.E., A.M.I.E.E., A.M.I.Mech.E.,

Municipal Electrical Engineer.

Municipal Office, Mussoorie, U.P., India,

June 14th, 1905.

Telegraphic Address: "Shanan, Mussoorie."

COUNTY BOROUGH OF WOLVERHAMPTON.

TETTENHALL PUMPING STATION EXTENSIONS.

CONTRACT No. 2.

The Corporation of Wolverhampton are prepared to receive TENDERS for a VERTICAL TRIPE-EXPANSION PUMPING ENGINE and OTHER WORK connected therewith from engine builders who will undertake to pay the rate of wages and observe the hours of labour recognised and agreed upon between the Trades Unions and the Employers respectively in the locality in which the work is to be performed, or such a rate of wages or hours as are equivalent or approximate thereto.

A copy of the Specification and Form of Tender may be obtained from Mr. E. A. B. WOODWARD, Waterworks Engineer, Town Hall, Wolverhampton, upon payment of the sum of Five Pounds, which amount will be returned to every engine builder who submits a *bona fide* Tender, but not otherwise.

Each Tender must be enclosed in a sealed cover addressed to "The Chairman of the Water Committee," and endorsed "Pumping Machinery," and delivered at my office on or before Friday, the 1st day of September next.

The right to decline the lowest or any Tender is reserved to the Corporation.

Town Hall, Wolverhampton,
July 4th, 1905.

HORATIO BREVITT,

Town Clerk,

CORPORATION OF DUBLIN.

TENDERS FOR ELECTRIC LOCOMOTIVES, ELECTRIC TRACTION MAINS, TRAMWAY TRACKS, OVERHEAD WIRES AND STREET POSTS, ELECTRIC AND STEAM CAPSTANS, &c., &c.

The CLEANSING COMMITTEE of the Corporation of the City of Dublin are prepared to receive TENDERS for the SUPPLY of THREE ELECTRIC LOCOMOTIVES for haulage of Refuse Wagons on the City Tramways; nearly 1,000 yards run of STREET TRAM TRACKS and ELECTRICITY MAINS, OVERHEAD TROLLEY WIRES, with STREET POSTS and CONNECTIONS; TWO ELECTRIC and ONE STEAM CAPSTAN, &c.

Specification, with Terms and Conditions, and Form of Tender may be inspected at the Office of the City Engineer, Mr. SPENCER HARTY, M.I.C.E.I., City Hall, Dublin, on and after Friday, July 7th, 1905, and may be obtained from him on payment of £1 1s., which sum will be refunded on the return of the Specification filled up with a *bona fide* Tender.

Tenders, sealed and endorsed, must be addressed to the Chairman, Cleansing Committee, 3, Cork Hill, Dublin, and delivered not later than 12 o'clock noon on Tuesday, July 25th, 1905.

The Committee do not bind themselves to accept the lowest or any Tender.

FRED J. ALLAN,

Secretary.

Cleansing Committee's Offices, 3, Cork Hill, Dublin.

CITY OF HULL.

PUBLIC HALL, VICTORIA SQUARE.

The CORPORATION is prepared to receive TENDERS for the SUPPLYING and FIXING of the CONSTRUCTIONAL STEELWORK, &c., for the New Public Hall, Hull.

Forms of Tender and other particulars may be obtained of the City Architect. Prints of the suggested arrangement will be supplied on payment of 10s. 6d. to the City Treasurer, which sum will be returned on receipt of a *bona fide* Tender.

Tenders, endorsed "Tender for Constructional Steelwork, Public Hall," are to be addressed to the Chairman of the Property Committee, and delivered at the Town Clerk's Office, Hull, before 10 a.m. on Friday, July 28th, 1905.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,

JOSEPH H. HIRST,
City Architect.

Town Hall, Hull,
July 5th, 1905.

THE RURAL DISTRICT COUNCIL OF CHELMSFORD.

The above-named Council invite TENDERS for SUPPLYING and LAYING about 2,518 yards of 6 in. and about 233 yards of 3 in. CAST-IRON WATER PIPES, and for the supply and FIXING of VALVES and FITTINGS, in the Parishes of Springfield and Great Baddow, in the County of Essex.

General Conditions, Specification, Bill of Quantities, and Form of Tender may be obtained from the undersigned on payment of a deposit of £1, which will be returned on receipt of a *bona fide* Tender accompanied by all other papers properly filled in. Plans may be seen on application to the undersigned.

Sealed Tenders, endorsed "Pipelaying," are to be delivered at my office not later than noon on July 28th, 1905.

The Council do not bind themselves to accept the lowest or any Tender.

JAMES DEWHIRST, A.M.I.M.E.,

Avenue Chambers, Chelmsford,

Engineer.

July 3rd, 1905.

ABERDEEN HARBOUR.—DOCK RAILWAYS.

The Aberdeen Harbour Commissioners are prepared to receive TENDERS for the SUPPLY, DELIVERY, and FITTING UP COMPLETE OF MANGANESE STEEL POINTS and CROSSINGS, and SPECIAL TRACK WORK, required for Dock Railway Layouts.

Copy of the Specification, Schedule of Quantities, and the Contract Drawings, may be obtained from the undersigned on payment of Two Guineas, which will be returned in due course to *bona fide* Offerors who return all the documents issued.

Tenders, endorsed "Tender for Special Track Work," are to be lodged with the undersigned not later 12 o'clock noon on Monday, July 31st, 1905.

R. GORDON NICOL,

Harbour Engineer's Office, Aberdeen,

Engineer.

July 14th, 1905.

PAGE'S WEEKLY

Contracts and Appointments Open

COUNTY OF LONDON.

TO CRANE-MAKERS, ENGINEERS, AND OTHERS.

THE LONDON COUNTY COUNCIL invite

TENDERS FOR THE MANUFACTURE, SUPPLY, and DELIVERY of (a) One 5-ton OVERHEAD ELECTRICALLY-DRIVEN TRAVELLING CRANE, and (b) One 2½-ton OVERHEAD ELECTRICALLY DRIVEN TRAVELLING CRANE.

Persons desiring to submit Tenders may, on and after Tuesday, the 18th day of July, 1905, obtain the Specifications, Drawings, Forms of Tender and other particulars at the County Hall, Spring Gardens, S.W., upon payment to the Cashier of the Council of the sum of £s. This amount will, after the Council or its Committee shall have come to a decision upon the Tenders received, but not before, be returned to the Tenderer, provided he shall have sent in a *bona fide* Tender and not have withdrawn the same, but in no case will the fee be returned unless a *bona fide* Tender is submitted. Full particulars of the work may be obtained on application at the County Hall previously to the payment of the fee for the Specification, &c. Tenders must be upon the official forms, and the printed instructions contained therein must be strictly complied with. The Contractors will be bound by the Contract to pay to all workmen (except a reasonable number of legally bound apprentices) employed by them, wages at rates not less, and to observe hours of labour not greater, than the rates and hours set out in the Council's list; and such rates of wages and hours of labour will be inserted in and form part of the Contract by way of schedule. Each Tender is to be delivered at the County Hall, in a sealed cover, addressed to The Clerk of the London County Council, Spring Gardens, S.W., and marked "Tender for Overhead Electrically driven Cranes, L.C.C. Tramways." No Tender will be received after Ten a.m. on Tuesday, the 25th day of July, 1905. Any Tender which does not comply with the printed instructions for Tender may be rejected.

The Council does not bind itself to accept the lowest or any Tender, and it will not accept any Tender which is not strictly in accordance with the Specification, or the Tender of any person or firm who shall on any previous occasion have withdrawn a Tender after the same had been opened, unless the reasons for withdrawal were satisfactory to the Council.

G. L. GOMME,
Clerk of the London County Council.

County Hall, Spring Gardens, S.W.,
July 14th, 1905.

EXMOUTH URBAN DISTRICT COUNCIL

WATERWORKS DEPARTMENT.—LITTLEHAM WATER SUPPLY.

SUPPLY OF CAST-IRON PIPES.

The Urban District Council of Exmouth invite TENDERS for the SUPPLY of PIPES in connection with the above.

Conditions, Schedule, and Specification can be obtained from the undersigned on and after Thursday, the 13th inst.

Sealed Tenders, endorsed "Water-Mains," are to be delivered to the Clerk of the Council, H. C. ADAMS, Esq., Public Hall, Exmouth, on or before 10 o'clock a.m., on Tuesday, July 25th.

The lowest or any Tender not necessarily accepted, neither will any allowance be made for Tenders.

SAMUEL HUTTON,
Surveyor and Water Engineer.

Public Hall Chambers, Exmouth.
July 7th, 1905.

CAERPHILLY URBAN DISTRICT COUNCIL.

TENDERS are invited for the Supply, Delivery, Laying, and Erection of HIGH and LOW-PRESSURE UNDERGROUND CABLES, KIOSKS, TRANSFORMERS, SWITCH GEAR, LAMP PILLARS, &c.

Copies of the Specification, with General Conditions and Form of Tender, can be obtained from Messrs. PREECE AND CARDEW, 8, Queen Anne's Gate, Westminster, S.W., on payment of a deposit of One Guinea, which will be returned on receipt of a *bona fide* tender. Duplicate copies of the Specification can be obtained on payment of 5s. (non-returnable).

Sealed Tenders, endorsed "Tender for Electric Lighting," must be delivered to the Chairman of the Caerphilly Urban District Council, Council Offices, Caerphilly, on or before 12 o'clock noon on Monday, July 24th, 1905.

The Council do not bind themselves to accept the lowest or any Tender.

Council Offices, Caerphilly.
By order,
W. SPICKETT, Clerk.

APPOINTMENTS OPEN.

MINISTRY OF PUBLIC INSTRUCTION, EGYPT.

SCHOOL OF AGRICULTURE.

An INSTRUCTOR in LAND SURVEYING and FARM ENGINEERING is REQUIRED to begin work on September 30th in the School of Agriculture, Ghizeh (near Cairo).

Preference will be given to candidates having experience of practice and teaching. They should be from 23 to 33 years of age, unmarried, and have a robust constitution.

A University Degree or College Diploma is an essential qualification. Salary about £295 per annum (££g. 24 per mensem), rising to about £393 per annum (££g. 32 per mensem). Allowance for passage out to Egypt. Bachelor quarters are provided.

Applications, with full statement of qualifications, and accompanied by copies only of testimonials, must be sent in before July 22nd, 1905, addressed to W. C. MACKENZIE, Esq., D.Sc., 5, The Crescent, Cromer, to whom candidates may apply for further information.

MINISTRY OF PUBLIC INSTRUCTION, EGYPT.

POLYTECHNIC SCHOOL OF ENGINEERING.

An INSTRUCTOR in ENGINEERING is REQUIRED, to begin work on September 30th, in the Polytechnic School of Engineering, Ghizeh (near Cairo).

The Instructor appointed will be engaged in teaching Descriptive Engineering and Hydraulics.

Candidates must have had practical experience as engineers, and have been engaged on work of a class intimately related to the subjects to be taught. They should be from 25 to 35 years of age unmarried, and have a robust constitution.

A University Degree or Diploma in Engineering is an essential qualification.

Salary about £430 per annum (££g. 35 per mensem), rising to about £533 per annum (££g. 45 per mensem). Allowance for passage out to Egypt. Bachelor quarters are provided.

Applications, with full statement of qualifications, and accompanied by copies only of testimonials, must be sent in before July 22nd, 1905, addressed to W. C. MACKENZIE, Esq., D.Sc., 5, The Crescent, Cromer, to whom candidates may apply for further information.

THE GLASGOW AND WEST OF SCOTLAND TECHNICAL COLLEGE.

The Governors invite APPLICATIONS for a POST about to be created in the Administrative Department of the College.

The principal duty of the officer appointed will be to secure the co-ordination of the work of the Continuation Classes in Mathematics, Engineering, Drawing, and Building Construction, conducted by the School Boards of Glasgow and Govan, with the College Evening Classes in the same subjects.

His work in this connection will be under the supervision of a Joint Committee representing the School Boards and the College. In regard to his other duties, he will be under the direction of the Governors of the College, and must place his whole time at their disposal.

Candidates must have a sound knowledge of two of the subjects named, as well as experience in teaching them.

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Applications must be sent to the SECRETARY, Technical College, Glasgow, on or before July 29th.

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Canvassing members of the Council, directly or indirectly, will disqualify candidates.

Town Hall, Leeds, July 1905. ROBERT E. FOX, Town Clerk.

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Applicants on, stating age and experience, with testimonials, to be sent in not later than Monday, July 31st, addressed to—

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In order to assure fair treatment to advertisers, each firm is indexed under its leading speciality ONLY.

Advertisers who prefer, however, to be entered under two or more different sections can do so by an annual payment of 5s. for each additional section.

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Hartley & Sugden, Ltd., Halifax.

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Stirling Boiler Co., Ltd., Motherwell, N.B.

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T. D. Robinson & Co., Ltd., Derby.

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New Zealand Mines Record, Wellington, New Zealand.
Spon, E. & F. N., 125, Strand, W.C.
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Melville & Macalpine, 615, Walnut Street, Philadelphia, Pa., U.S.A.

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Delange & Cie, Mce., Hoboken, near Antwerp.
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E. Green & Son, Ltd., Manchester.

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Allgemeine Elektrizitäts Gesellschaft, Berlin, Germany.
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Crypto Electrical Co., 3, Tyer's Gateway, Bermondsey Street, London, S.E.
Gent & Co., Ltd., Faraday Works, Leicester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
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Mather & Platt, Ltd., Salford Iron Works, Manchester.
Matthews & Yates, Ltd., Swinton, Manchester.
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Newton Brothers, Full Street, Derby.
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Turner, Atherton & Co., Ltd., Denton, Manchester.
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McLaren, J. & H., Midland Engine Works, Leeds.

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Lancaster & Tonge, Ltd., Pendleton, Manchester.

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Capel Fan Co., 13, Moseley Street, Newcastle-on-Tyne.
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Gibbs, John & Son, 80, Juke Street, Liverpool.
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PAGE'S WEEKLY Mining Ropes

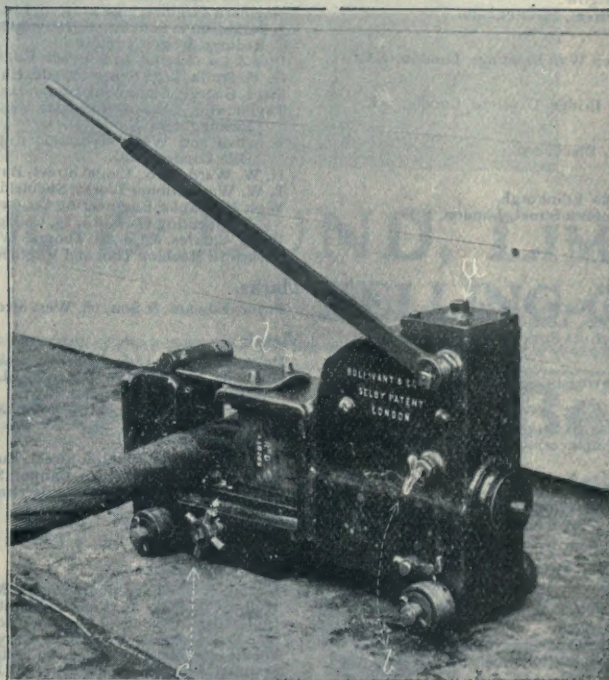
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Forgings (Drop).

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See Conveying Machinery.

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Askham Bros. & Wilson, Ltd., Sheffield.

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Farnley Iron Co., Ltd., Leeds, England.

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Luke & Spencer, Ltd., Broadheath, Manchester.

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Swift, George, Claremont Ironworks, Halifax.

Taylor and Challen, Ltd., Derwent Foundry, Constitution Hill, Birmingham.

Vauxhall and West Hydraulic Engineering Co., Ltd., 23, College Hill, London, E.C.

H. W. Ward & Co., Lionel Street, Birmingham.

T. W. Ward, Albion Works, Sheffield.

West Hydraulic Engineering Co. (see Vauxhall and West Hydraulic Engineering Co. Ltd.), 23, College Hill, London, E.C.

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Yorkshire Machine Tool and Engineering Works, Liversedge, Yorks.

Marks.

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Delta Metal Co., Ltd., East Greenwich, London, S.E.

Magnolia Anti-Friction Metal Co., Ltd., of Great Britain, 49, Queen Victoria Street, London, E.C.

Phosphor Bronze Co., Ltd., Southwark, London, S.E.

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Quaker City Rubber Co., Coronation House, Lloyd's Avenue, E.C.

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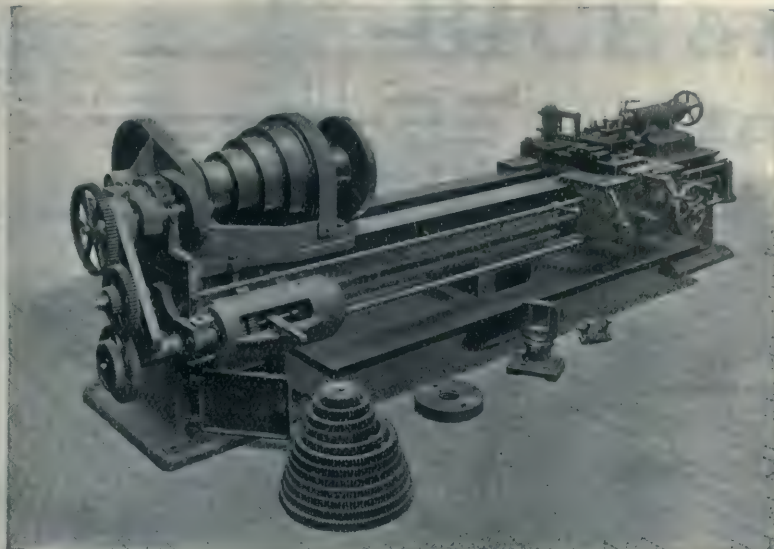
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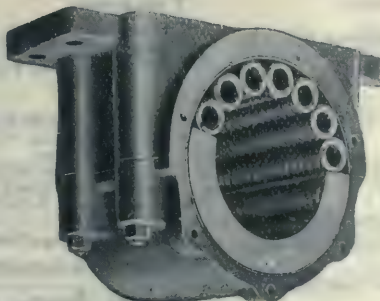
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Elliott & Fry, 55, Baker Street, London, W.

Pinch Bars.

Samson & Co., Garforth, near Leeds.

Pipe Wrenches (Chain).

Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Pistons.

Lancaster & Tonge, Ltd., Pendleton, Manchester.

Planished Sheets.

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Gustav Richter, Charlottenburg, near Berlin, Germany.

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Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

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Crosby Lockwood & Son, 7, Stationers' Hall Court, London, E.C.
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Spon, E. and F. N., 125, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.

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Drum Engineering Co., 27, Charles Street, Bradford.
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J. P. Hall & Sons, Ltd., Peterborough.
Hathorn, Davey & Co., Ltd., Leeds, England.
Positive Rotary Pumps, Ltd., 23, Northumberland Avenue, London, W.C.
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Greenwood & Batley, Albion Works, Leeds.
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Head, Wrightson & Co., Ltd., Thornaby-on-Tees.

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Williams, J. H., & Co., Brooklyn, New York, U.S.A.

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Thomas Smith & Sons of Saitley, Ltd., Birmingham.
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

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Stamps (Metal).

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British Steam Specialties, Ltd., Fleet Street, Leicester.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

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Thornycroft & Co., Ltd., J. I., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds.

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Saml. Buckley, St. Paul's Square, Birmingham.
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Recorders, Ltd., 171, Queen Victoria Street, London, E.C.
Warwick's Time Stamp Co., 134, Highbury Hill, London, N.

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Shaw, Joseph, Albert Works, Huddersfield.
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"Woodite" Company, Mitcham, Surrey.

PAGE'S WEEKLY

Machine Tools

Illustration shows
Hydraulic Flanging
Press (Progressive
Type), for Flanging
Boiler Plates, etc.



RICE & CO., (Leeds),

LIMITED,

LEEDS,

ENGLAND.

HYDRAULIC

Riveters,	Lifts,
Presses,	Pumps,
Cranes,	Accumulators,
Punches,	Intensifiers,
Shears,	Valves,
Hoists,	&c., &c.

A B C Code, 4th Edition, used.
Telegraphic Address: "Press, Leeds."
Telephone No.: 2362.

FRIED. KRUPP A.-G. GRUSONWERK, Magdeburg-Buckau.

Complete Machinery for

Cable Works,
Hemp & Wire Roperies,
India Rubber, Gutta Percha,
Linoleum & Celluloid Factories,

Sole Representative for Great Britain and Ireland:—

W. STAMM, 25, College Hill,
Cannon Street, London, E.C.



MACHINE TOOLS,

Special & General

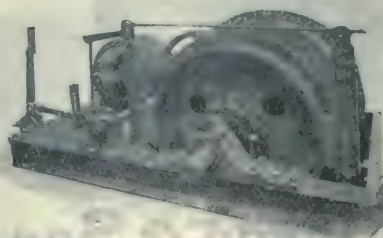
For Engineers, Ship-
builders, Boiler Makers,
Girder Makers, and
Bridge Builders.

G. F. SMITH,
LIMITED,

South Parade,
HALIFAX.

Telegrams: "Radial, Halifax."

Electric Hauling GEARS



Main and
Tail
Main Rope,
Endless
Rope
and
Portable,
Hoisting,
and Hauling
Gears.

M. B. WILD & CO.,

35 and 36, Clarence Chambers,
Corporation Street,
BIRMINGHAM.

PAGE'S WEEKLY Machine Tools

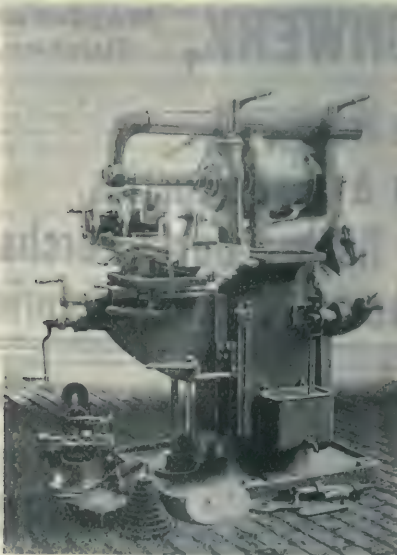
3 Styles of Drive |||| Belting
Belting and Gearing
Gearing

3'6" to 6'0" RADIALS

HIGHEST
RATE OF
FEEDS...

Largest English Makers.

Northern Engineering
(1900) Co., Ltd.,
HALIFAX.



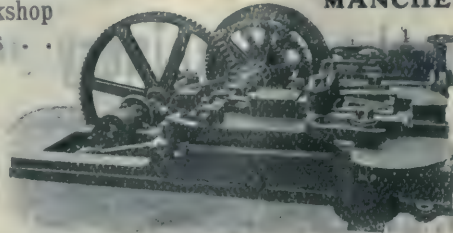
No. 2 Gear Feed Universal Miller.

J. Parkinson & Son,
SHIPLEY, ENGLAND.

CUNLIFFE & CROOM, Ltd.

Railway .
Workshop
Tools . .

Broughton Lane,
MANCHESTER.



Spoke Bending Machine.

HIGH SPEED LATHES



Our Speciality
up to

12-in. Centre.

Price List on
application.

**ACCURACY
GUARANTEED.**

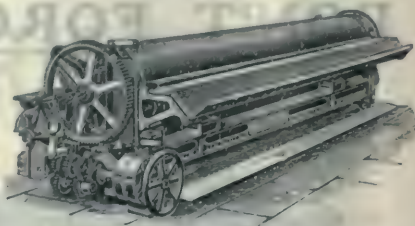
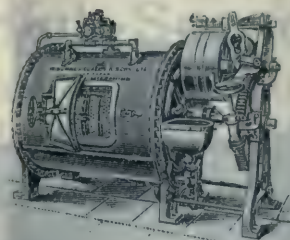
Telegrams :
"Leckenby, Benton
Halifax."

LECKENBY, BENTON, & CO.,
Perseverance Ironworks, HALIFAX.

PAGE'S WEEKLY

Machine Tools

Laundry Machinery AND COOKING APPARATUS.



W. Summerscales & Sons, Ltd.
Phoenix Foundry, KEIGHLEY, ENGLAND.

CATALOGUE
ON APPLICATION.

PLEASE MARK INQUIRIES P.W.

Dean, Smith, & Grace,
LTD.,

Lathe Manufacturers,

Established
1865.

KEIGHLEY.

WRITE FOR CATALOGUE.

See Our Advertisement next Week.

HIGH-CLASS LATHES AND RADIAL DRILLS.

Write for our Lists.



D. MITCHELL & CO.
Ltd.,

Parsonage Works, KEIGHLEY.

Telegrams: "TOOLS, KEIGHLEY."

On War Office and India Office Lists.

HIGH-SPEED PLANERS.

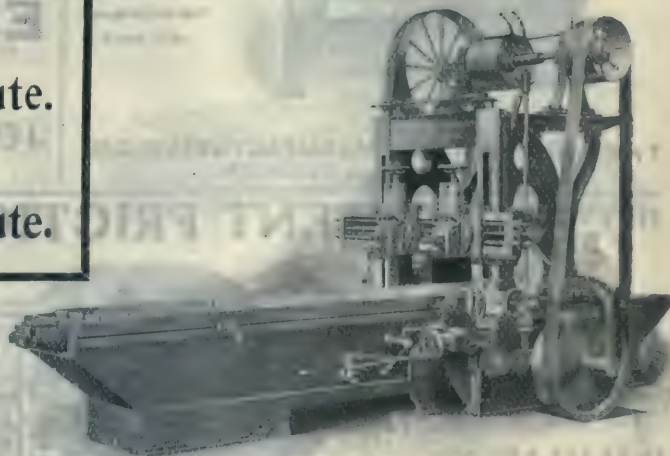
CUTTING AT

60 ft. per minute.

RETURNING AT

160 ft. per minute.

Note these Speeds, and compare
them with those of your own
Planers.



36 in. by 36 in. by 10 ft. Bateman High-speed Planer.

Bateman's Machine Tool Co., Ltd., Leeds.

PAGE'S WEEKLY Machine Tools

DON'T FORGET

Lathes, Planers, and Shapers

ARE OUR SPECIALITIES.



High-Grade Machines Only
in Stock for
Immediate Delivery.

C. Redman & Sons,
National Telephone: 308.
Telegrams: "REDMANS, ENGINEERS, HALIFAX."
HALIFAX.

TURRET LATHES.

BRITISH MAKE THROUGHOUT.



See our page
Advertisements
next week.

THE ECLIPSE TOOL MANUFACTURING CO.,
LINWOOD, near GLASGOW.

EFFICIENCY

IS THE

KEYNOTE

OF OUR

ESTABLISHMENT

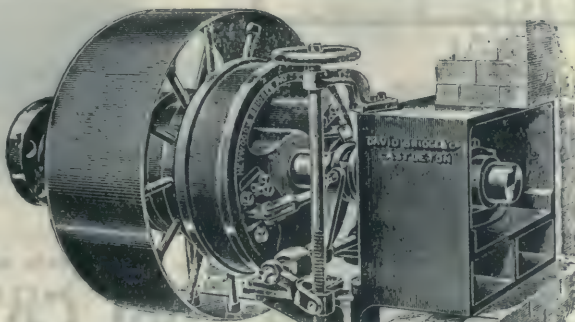
PROVE IT BY A VISIT.

JOHN LANG & SONS,
Johnstone, near GLASGOW.

HEYWOOD & BRIDGE'S PATENT FRICTION CLUTCH and SHAFT COUPLING.

WE MAKE
CLUTCHES,
SHAFTING,
GEARING and
HAULING
INSTALLATIONS
A SPECIALTY.

Sixty Page Work—Free.
DON'T MISS THIS.



Patentees and Sole Makers:
DAVID BRIDGE & CO.
Castleton Iron Works,
ROCHDALE, LANCs.

London Office:
35, Queen Victoria Street,
E.C.

PAGE'S WEEKLY

Machine Tools

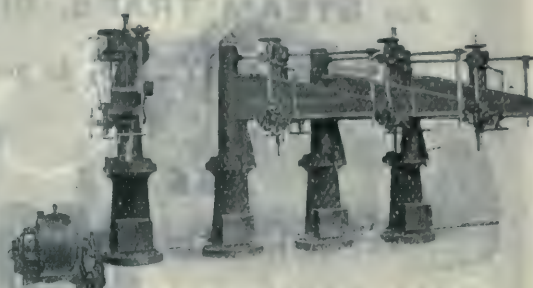
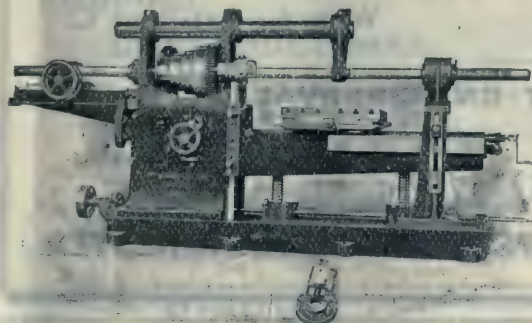
PROFITABLE DRILLING.

High-Speed Radials

For GIRDER, BRIDGE, and
CONSTRUCTIONAL WORK.

Made singly or in gangs. Motor or belt driven. CENTRAL spindle thrust. High spindle velocity. QUICKER than punching, and gives better results.

HUNDREDS SUPPLIED.



For . . .

Drilling, Boring, Milling, etc.,

our new Machines, as illustration, are

UNAPPROACHABLE.

Great range of speeds and feeds. Extra power for high speeds. Self-acting in all motions.

**THIS MACHINE WILL DO THE WORK OF
SEVERAL SPECIAL MACHINES.**

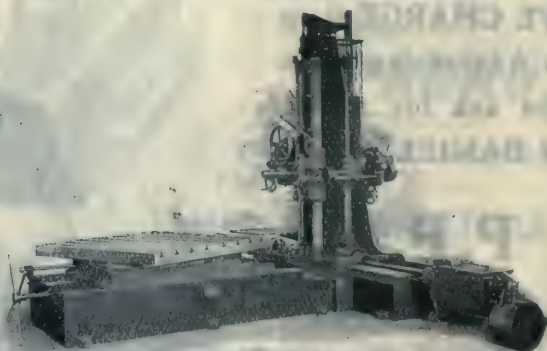
Horizontal Drilling and Tapping

Can be executed best

**AT MODERN SPEEDS
and FEEDS,**

on our New Drill, as illustrated.

No side twist on spindle, gear speeds and feeds. Power rotary table. Utmost facility of manipulation. Unequalled efficiency at high speeds.



Full Particulars of any of above Tools from the **SOLE MAKERS:-**

William Asquith, Ltd.,

Well Road Works,

HALIFAX,

ENGLAND.

Contractors to

THE ADMIRALTY.

WAR OFFICE,

and Leading Engineering

Works at Home and Abroad.

PAGE'S WEEKLY Packing, &c.

When Specifying

For **STEAM TRAPS, PISTONS, METALLIC PACKINGS,**
STEAM DRYERS, do not omit to state

"The Lancaster" (R.T.M.)

It will ensure you obtaining satisfaction.

Write for Catalogue C.

FIRST ORDERS SENT ON APPROVAL.

LANCASTER & TONGE, LTD.,

PENDLETON, MANCHESTER.

WE CHARGE it up
to Advertising when
you ask for a Set
of DANIEL'S

P.P.P.

for Engine, Pump,
or Compressor.



The Finest and Most
Scientific Rod Packing
made.

Experts handle it from
first to last.

So don't hesitate to
tell of your wants.

We'll both be glad
about it afterwards.



PAT AUG. 7, 1894.

Quaker City Rubber Co.

Coronation House,
Lloyd's Avenue,

LONDON, E.C.

(Late 101, Leadenhall St., E.C.)

RONALD TRIST & CO.,
Managers for Great Britain.

PAGE'S WEEKLY

Steelwork, &c.

CLAYTON, SON & Co.,

LTD.

HUNSLET, LEEDS,

MAKERS OF THE

LARGEST STEEL TANK

AND THE

LARGEST GASHOLDER
IN THE WORLD.

ROOFING,

CONSTRUCTURAL

STEEL WORK,

PETROLEUM TANKS.

Wires:—

London Office:—

"Gas, Leeds."

80, Queen Victoria Street.

Tanks

Cast Iron Pressed & Riveted Steel
RIVETTED STEEL MAINS

Water-Tar-Oil-Acid
GAS HOLDERS
Grain Silos. Pontoons.
UP TO ANY DIAMETER.

Castings

CAST IRON PIPES
VALVES
Furnace Fittings
STILLS & DECOMPOSERS
Columns & Girders
BELLS & HOPPERS.
UP TO ANY DIAMETER.

Structures

Bridges
Roof Scaffolding
Coal Bunkers
WORKSHOP & POWER STATIONS
Turntables
MONOLITHS
CHIMNEYS

Repairs Alterations Spare Parts

Send for Estimates.

Works: STOCKTON ON TEES.

ASHMORE, BENSON, PEASE & CO. LTD.

Telegrams: GASHOLDER
Telephone: N917

W. & O. GILMOUR,

Machine Belt Manufacturers,
St. John's Hill,
EDINBURGH.

Telegrams: "BELTING, EDINBURGH."

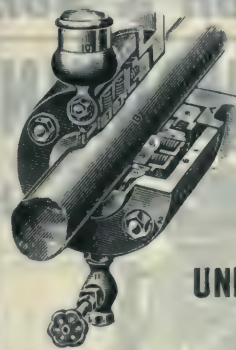
Telephone No.: 575 Central.

Belting

MADE FROM

PURE OAK TANNED
LEATHER.Quality is Our First
Consideration.

For over Eighty Years we have been makers of Leather Belting, but owing to the present demands of trade we have just laid down extensive plant, and are now in a position to supply Oak Tanned Leather Belting at as reasonable a price as is consistent with first-class goods.



BLOCK PACKING.

PACKING

that

PACKS.

Over 160,000 Supplied.

UNITED STATES METALLIC PACKING CO., LTD., BRADFORD.



Contractors to H.M. Government.

BRADBURY & CO., LTD.

Capstan
Lathes and
Labour
Saving Tools.



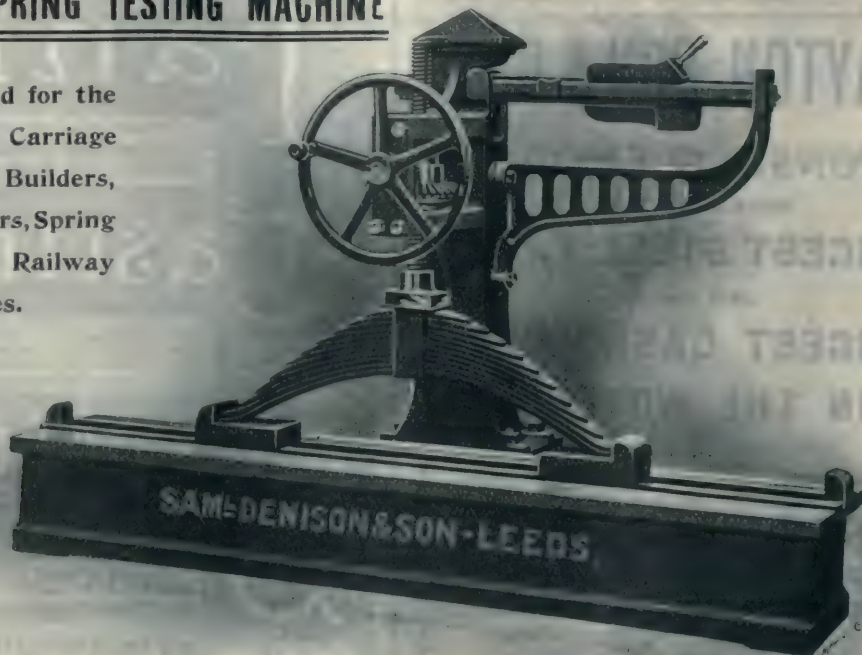
WELLINGTON
WORKS,
OLDHAM.

Lists Free

PAGE'S WEEKLY Testers, Weighers, &c.

DENISON'S SPRING TESTING MACHINE

Specially adapted for the use of Railway Carriage Builders, Wagon Builders, Motor Car Builders, Spring Makers, and Railway Companies.



Saml. Denison & Son, Ltd., *Hunslet Moor, Near* **LEEDS.**

WEIGHING MACHINES & GRAIN SCALES.

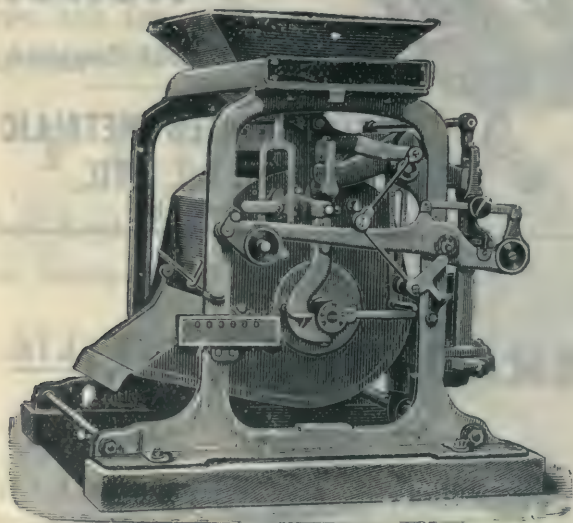
HOWES' WEIGHING MACHINES
for all purposes.

AUTOMATIC GRAIN SCALES

for use in

ELEVATORS, FLOUR MILLS, &c.

WEIGHINGS ACCURATE.



Sole Manufacturers of the "LITTLE GIANT" Turbines, Water Motors, and Pelton Wheels, &c.

S. HOWES CO.

Head Office:— 64, MARK LANE, LONDON, E.C., ENGLAND.

PAGE'S WEEKLY Systems for Engineers

A Demonstrable Fact!

If you will give us the opportunity we can demonstrate to you the desirability of adopting the **ROCKWELL-WABASH BUSINESS SYSTEMS.**

You may think your present methods are all that can be desired, but the probable reason for thinking so, is because you have not seen anything better.

No matter how good a system you have, we can improve it, and if you will indicate on the coupon below what subjects you are interested in, and send it in to us, we will forward our Information Forms, and on their return to us with the information asked for, we will be pleased to demonstrate to you the best means of handling the subjects specified, and advise you, without charge or other obligation.

Messrs. ROCKWELL-WABASH CO., LTD.,

69, Milton Street, London, E.C.; 164, Buchanan Street, Glasgow; 50, Deansgate Arcade, Manchester.

Please send us your Information Forms relative to subjects below numbered....., which are to be sent without expense or other obligations upon us.

Name.....

Address.....

Business.....

P-8

1. FACTORY COSTS
2. STORES LEDGERS
3. PERPETUAL CARD LEDGERS
4. QUOTATIONS—GIVEN
5. QUOTATIONS—RECEIVED
6. ADVERTISING RECORDS FOR ADVERTISERS
7. ADVERTISING RECORDS FOR AGENTS
8. ADVERTISING RECORDS FOR PUBLISHERS

9. STAFF REGISTER
10. CUSTOMER'S LISTS
11. ADDRESSING LISTS
12. FOLLOW-UP-SYSTEMS—SALES
13. FOLLOW-UP-SYSTEMS—OVER-DUE ACCOUNTS
14. CREDIT RATINGS
15. SHAREHOLDERS' REGISTER
16. FILING CATALOGUES
17. FILING CORRESPONDENCE
18. FILING INVOICES

19. PATTERN RECORDS
20. DRAWING RECORDS
21. ORDER SYSTEMS
22. DOCTORS, DENTISTS, AND OCULISTS
23. MEMBERSHIP RECORDS
24. INSURANCE RECORDS FOR COMPANIES
25. INSURANCE RECORDS FOR BROKERS
26. INSURANCE RECORDS FOR AGENTS

MATTHEWS & YATES. L^{TD}.**Swinton, MANCHESTER.****The Cyclone
Steam Fan**

IS EXTENSIVELY USED FOR

Ship VentilationAND SITUATIONS WHERE OTHER
MOTIVE POWERS ARE NOT AVAILABLE.

LONDON: 84, Gray's Inn Road, W.C.

GLASGOW: 144, St. Vincent Street.

LEEDS: Standard Buildings, City Square.

**CATALOGUE COVER.**Those who issue CATALOGUES ought
to see this.COVER WITH SECTIONAL CATALOGUE
INSERTED.New Editions as issued can be
inserted, old Editions withdrawn.**CHEAP AND EFFECTIVE.**

Sample Cover on application:—

THE TRADING & MANUFACTURING CO., Limited,
27, Fleet Street, LONDON, E.C.

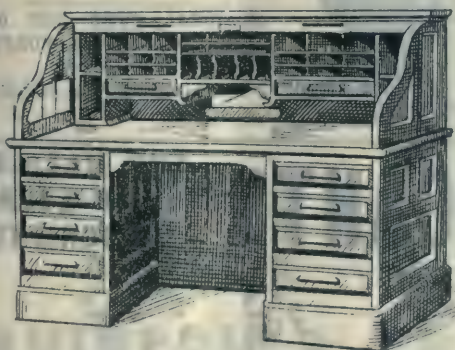
Index to Advertisers.

Advertisements not appearing this week will be found by reference to the preceding or following issues, with the exception of those appearing monthly.

	PAGE		PAGE		PAGE
Addy, George, & Co.	—	Cambridge Scientific Instrument Co., Ltd.	—	Gibbs, J., & Son ...	36
Ahlers, Ad.	—	Campbell Gas Engine Co.	5	Gilmour, W. & O.	19
Allen, Edgar, & Co., Ltd.	—	Capell Fan Co.	42	Glover & Co., M.	5
Allgemeine Elektrizitäts-Gesellschaft	—	Clafke's Crank & Forge Co., Ltd.	—	Graham, Morton & Co., Ltd.	3
Allis-Chalmers Co.	—	Clayton, Son, & Co., Ltd.	19	Grantham Crank & Iron Co., Ltd.	22
Anderson & Son, Ltd., D.	—	Concentric Condensers, Ltd.	34	Green & Son, Ltd., E.	Inside Back Cover
Ashmore, Benson, Pease & Co.	10	Consett Iron Co., Ltd.	—	Greenwood & Batley, Ltd.	36
Askham Bros. & Wilson, Ltd.	—	Cort, Arthur, & Co.	—	Griffin & Co., Ltd., Charles	11
Asquith, William, Ltd.	17	Crosby Lockwood & Son	—		
Atlantic Press	41	Crypto Electrical Co.	—		
Avery, Ltd., W. & T.	—	Cunliffe & Croom, Ltd.	13		
Babcock and Wilcox, Ltd.	3	Davidson & Co., Ltd.	25	Hadfield's Steel Foundry Co., Ltd.	—
Baldwin Locomotive Works	28	Davis & Primrose	3	Hagan's Locomotive Works	—
Barns & Son, W.	—	Dean, Smith & Grace, Ltd.	15	Halden & Co., J.	—
Bateman's Machine Tool Co.	15	Deighton's Patent Flue & Tube Co., Ltd.	—	Hall & Co., B. J.	—
Baynes, Charles	Inside Front Cover	Delange & Cie, Mc.	—	Hall & Sons, Ltd., J. P.	24
Beldam Packing and Rubber Co.	—	Delta Metal Co., Ltd.	Outside Back Cover	Hannan & Buchanan	—
Benn, Sykes	—	Denison, S., & Son	30	Hardy Patent Pick Co.	—
Bennis & Co., Ltd., Ed.	31	Dobbie-McInnes, Ltd.	3	Hartley & Sugden, Ltd.	—
Bertrams, Ltd.	24	Drum Engineering Co.	42	Hasekneveler Söhne, C. W.	—
Binney & Son	—			Hathorn, Davey & Co., Ltd.	—
Bleichert & Co., A.	—	Eclipse Tool Manufacturing Co.	16	Head, Wrightson & Co., Ltd.	4
Blumann & Stern, Ltd.	24	Elliott & Fry	4	Heenan & Froude	5
Bolton & Co., A.	—	Elliott-Fisher Co.	—	Holmes & Co., W. C.	—
Booker & Sullivan	—	Empire Typewriter Co.	—	Horsfall Destructor Co.	32
Booth & Bros., Ltd., Joseph	—	Enke, Carl	—	Howard Bros.	39
Bradbury & Co., Ltd.	19			Howes Co., S.	20
Brand, Ed.	3	Fairbanks Co.	26	Hudswell, Clarke & Co., Ltd.	Inside Front Cover
Brett's Patent Lifter Co., Ltd.	4	Fairley & Sons, James	Outside Back Cover	Hughes & Lancaster	5
Breuer, Schumacher & Co.	—	Farnley Iron Co., Ltd.	—	Hughes, G. H.	3
Bridge & Co., David	16	Firth, Ltd., William	—	Hunslet Engine Co.	—
British Advertiser Service Bureau	4	Fleming, Birkby & Goodall, Ltd.	—	Hunt and Mitton	—
British Steam Specialities, Ltd.	42	Fowler, John, & Co. (Leeds), Ltd.	28	Hyatt Roller Bearing Co.	11
Broadbent & Sons, Ltd., Thos.	—	Fraser & Chalmers, Ltd.	—		
Broadbent, T. W.	42	Frictionless Engine Packing Co., Ltd.	—		
Brown, Andrew, & Co.	—				
Buckley, Samuel	—	Garrett & Sons, Ltd., R.	—	India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.	—
Bullivant & Co., Ltd.	9	Gent & Co., Ltd.	—	Inglesant, T., & Sons, Ltd.	23
				Jones and Lamson Machine Co.	5

"DERBY" THE STANDARD OF COMPARISON. Roll Top

*Most elegantly designed and finished.
Full of convenient devices other Desks have
have not got.*



THE DESK THAT DELIGHTS.

Sent to your door on receipt of deposit, balance **£1** at convenience.

Prices from **£4 15s.**, carriage paid.

Its ingenious construction, absolute convenience and elegance have made it the favourite desk with thousands of business and literary men. Full of natty contrivances for saving time and worry. No lost papers—everything in its place and automatically locked up. An office necessity. Essential to the complete furnishing of every cultured home.

T. INGLESANT & SONS, Ltd.,

*Upholsterers and Cabinet Makers by Royal
Warrant to His Majesty the King.*



Atlas House, Leicester.

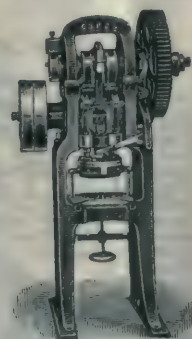
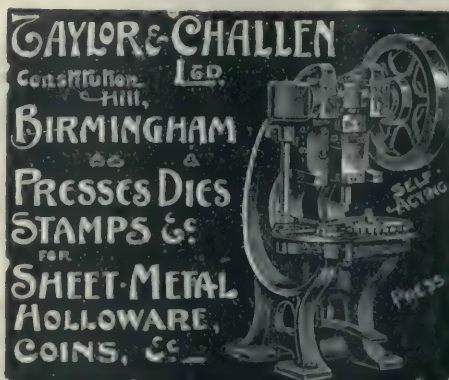
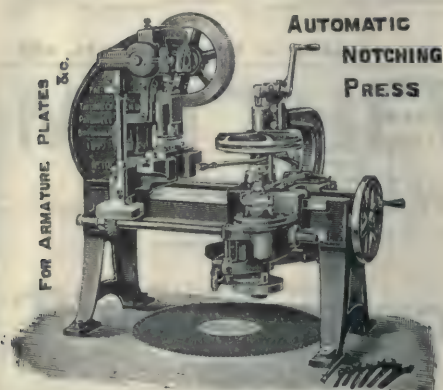
FREE

Write To-Day.

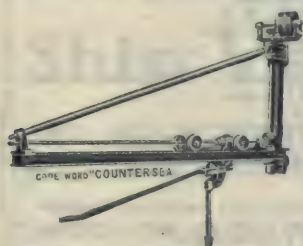
A Postcard now will bring you our handsome Desk Catalogue. Elegantly illustrated and finished. Contains many valuable hints on furnishing. Don't delay sending.

PAGE'S WEEKLY

Miscellaneous



MACHINE TOOLS



Radial Counter-Sinking Machine.

FOR
Engineers,
Shipbuilders,
Boiler Makers,
Etc., etc.

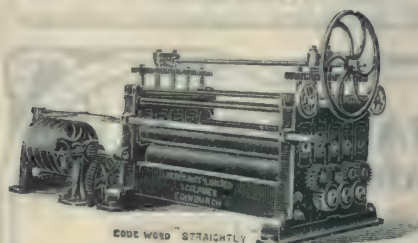


Plate Straightening Machine.

London Office :
Moorgate Station
Chambers, E.C.

BERTRAMS, LTD.,
St. Katherine's Works, Scleennes,
EDINBURGH.

J. P. HALL & SONS, Ltd.,

ENGINEERS,
PETERBOROUGH.

We make a SPECIAL Compound
Direct Acting Slow Running

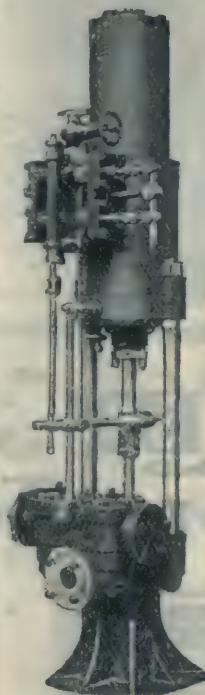
Boiler Feed Pump

ECONOMICAL AND EFFICIENT.

We deliver 100 lbs. of Water for
the expenditure of 1 lb. of Steam.
This with our 2,000 gallon Pump,
and a much higher efficiency as
the size of the Pump increases.

AN IDEAL PUMP FOR GENERAL
BOILER FEEDING PURPOSES.

APPLY FOR PARTICULARS.



HIGH-CLASS LUBRICANTS

FOR MACHINERY
OF EVERY
DESCRIPTION.

LAND and
MARINE ENGINE
and CYLINDER
OILS.

DYNAMO and
GAS ENGINE
OILS.

CRANK
CHAMBER and
STEAM TURBINE
OILS.

MOTOR and
CYCLE OILS.

SOLIDIFIED OILS
and GREASES for
all PURPOSES

BLUMANN & STERN, LTD., Plough Bridge, Deptford, LONDON, S.E.

Contractors to H.M. Government, Home, and Foreign Railways, &c.

PAGE'S WEEKLY

Miscellaneous

Some "Swan" Points.

WHICH WOULD
SUIT YOU?

For a Bold Hand - - -	use a Broad Point, say a "J" Swan.
For an Easy Running Hand -	.. Turned-up "Swan."
For Book-keeping - - -	.. Short Medium Point "Swan."
For Shorthand - - -	.. Long Fine Point "Swan."



Broad.



Med. Brd.



Medium.



Fine.



Broad.



Med. Brd.



Medium.



Fine

EVERY STEEL NIB CAN BE
SUCCESSFULLY MATCHED IN

A "SWAN"

FOR EVERY HAND AND EVERY
WORK.

Prices from 10s. 6d., 16s. 6d., 25s., up to £20, post free.

Of all Stationers and Jewellers.

Write for New Catalogue, post free.

MABIE, TODD, & BARD,

79 & 80, High Holborn, W.C., 93, Cheap-

side, E.C., 95a, Regent St., W., London;
3, Exchange Street, Manchester; and Brentano's, 37, Ave. de l'Opera, Paris.

UNIVERSAL
GIANT

RING OILING BALL AND SOCKET POST HANGERS.



These Hangers are universally adjustable, the bearing being susceptible of movement in any direction. In fact, the construction is such that absolute self-adjustment is secured. In the design, durability, adaptability, and appearance are made the prominent factors. The Post Hanger, being equipped with side screws, provides for lateral adjustment, which is very essential to secure the closest alignment.

WRITE FOR CATALOGUE NO. 181.

GLASGOW OFFICE:
56, Bothwell Street.

The Fairbanks Company,

78-80, City Road, LONDON, E.C.

PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the Engineering, Electrical, Mining, Iron and Steel, and Shipbuilding Industries.

VOL. VII.

LONDON, FRIDAY, JULY 21, 1905.

No. 45.

The Offices of "Page's Weekly,"

Wednesday Evening.

WE suppose that in London there is no more burning question than that on which the Traffic Commissioners have just presented their painstaking and voluminous report. In a question involving so many points of a purely technical description the Commission adopted the best course practicable in forming an advisory board of engineers, and reference to the summary of the report, presented elsewhere, will serve to show that their recommendations to a great extent form the back-bone of the report. It is true that their enthusiasm is more concerned with the extension of tram routes and the linking up of railways than with the new arteries proposed by the advisory board, but the situation is somewhat desperate, and the Commissioners will need little excuse for leaning in the direction of solutions which are practicable and capable of realisation at no far-distant period. Their dicta on the subject of the motor omnibus, their preference for shallow subways, and sundry other details upon which they are more or less emphatic, may not pass unchallenged, but it can scarcely be denied that in thoroughly sifting the evidence brought before them, and in ventilating the subject in the light of the latest engineering practice, they have rendered an incalculable service to the Metropolis. No one expected that the Commission would reduce confusion and chaos to simplicity and

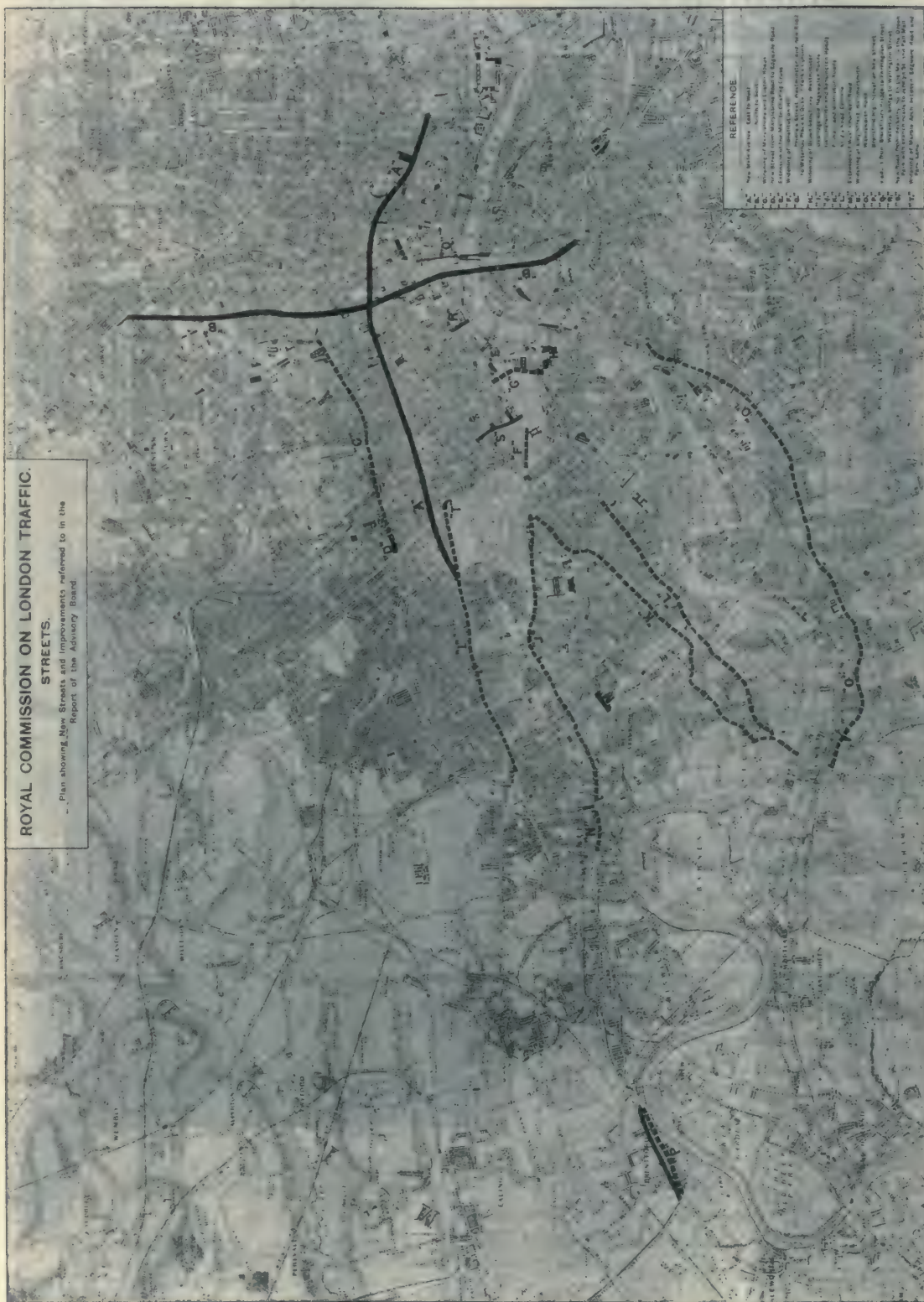
order as it were by the wave of a magic wand; but by proposing the formation of a Traffic Board they have at least done something to ensure that their work will be carried on steadily towards the desired goal. At the same time, a period will be put to the succession of mistakes which have brought about the "problem."



Photo, Elliott & Fry

THE RIGHT HON. SIR JOSEPH C. DIMSDALE, BART.,
K.C.V.O., M.P.

One of the members of the Royal Commission on London Traffic, who dissents from some of the conclusions arrived at by his colleagues. (See page 115.)



THE ROYAL COMMISSION ON LONDON TRAFFIC.

The above plan reproduced from Book I. of the London Traffic Commission Report, shows the new streets and improvements referred to in the report of the Advisory Board. By far the most important of their recommendations is a proposal for the construction of two main avenues 140 feet wide (marked A and B on plan), one from west to east to connect Bayswater Road with Whitechapel, and passing through the City of London in the neighbourhood of London Wall; the other from north to south to connect Holloway with the Elephant and Castle, passing by a new bridge across the Thames near the western boundary of the City. The report is summarised in this issue. (See page 147.)

The Commissioners, it should be noted, were not by any means unanimous. Sir Joseph Dimsdale and Sir George Gibb, while signing the report, found it necessary to append special addenda; and Sir George Bartley did not sign it at all. Sir Joseph Dimsdale is chiefly emphatic on the subject of the right of "veto" upon the construction of the tramways in the City. Bearing in mind the City's narrow and tortuous streets and the necessity of avoiding any obstacles preventing the rapid action of the Fire Brigade in case of need, he says that as far as the experience of the Corporation goes, under no conceivable conditions could tramways be worked in the City. He also says, "I consider that the proposal to run a street east and west through the City of London 140 feet in width is one which, if carried out, would be in every way disastrous to the City, as the most crowded emporium resorted to by the multitudes of people who are interested in the world's commerce and finance, of which it is the most busy centre." Sir Joseph dwells upon the "portentious figures" representing the cost of the proposed main north and south avenues, with subways, railways, and tramways (£24,100,000 or more), and remarks that the proposals of the advisory board have been put forward without rebutting evidence being heard, and without all necessary aspects of the questions involved being debated and sufficiently considered.

Sir George Gibb thinks it should be distinctly stated that a railway from Shepherd's Bush, *via* Kensington, Piccadilly, and the Strand to the City, is required, and that such railway should pass, as near as possible, to Liverpool Street and Broad Street stations, and should be connected, at either end, with the Central London Railway by end-on junctions, so that trains might be run on a complete circle, *via* the Central London Railway and the proposed new line, thereby increasing the carrying capacity of the Central London Railway; and

securing the fullest public benefit from the capital already expended on that undertaking. If, by arrangement between all companies concerned, portions of the authorised Metropolitan District deep level line, and of the Great Northern, Piccadilly, and Brompton Railway west of Cranbourne Street, Piccadilly, could be utilised as part of the new City route, the portion of the Brompton line north of Piccadilly being worked by a "shuttle" service, this would, in his judgment, be a plan which would best serve the public requirements at the least cost. He thinks that the urban railways already authorised within the central area, with the addition of the proposed lines from Shepherd's



Photo, Elliott & Fry.

SIR JOSEPH JONAS, LORD MAYOR OF SHEFFIELD,

Whose knighthood has just been announced in connection with the royal visit to Sheffield. Born at Bingen-on-the-Rhine in 1845, he commenced business in Sheffield as a steel manufacturer at the age of twenty-five, and has thus been prominently identified with the industry for many years.

Bush *via* Kensington to the City, and from Victoria to Marble Arch, will adequately provide for the public requirements, when these railways have been brought into full and convenient interchange connection with all the lines carrying suburban traffic to London, and that further expenditure on new railways within the central area with the object of providing for the through running of suburban trains would be a waste of capital.

Sir G. C. T. Bartley, K.C.B., M.P., in his statement, says the general purport of the report seems to be an attempt to improve locomotion in London on the lines on which improvements have been made in the last two generations, and chiefly by relying on more tramways in the "West End" of London in the existing streets, many of which are very narrow. It is true that the widening of streets and the creation of new streets are referred to as, of course, important and desirable, but it is really left to be accomplished almost accidentally, as in the past, and is not made the basis of all improvements. This, he cannot think, is a solution of the problem, and at best but a very temporary palliative. The main principle of permanently improving the traffic arrangements of London lies, he thinks, in widening and enlarging the streets, and especially in forming one or two new broad thoroughfares, as has been done in the chief cities of the Continent. At least one, he says, is required to run north and south across the Thames, and the other east and west, north of the Thames. This improvement is specially important, as London possesses comparatively few alternative routes, and the necessity of facing the cost of at least two thoroughfares seems to him to have been established. If these were made 150 ft. wide, with two lines of surface tramways, and subways for at least four lines of rails, practically all the great cause of congestion would be materially relieved, if not done away with, and the traffic, both pedestrian and vehicular,

relieved all over the London area, both now and for many years to come. The subway in the broad avenues would also be connected by subways for electric tramways with all the main lines of railway to London, and in this way a continuous route would be made from all parts round London direct to the centre without passengers being required to go into the streets at all.

The production of American crucible steel in 1904 is shown to have amounted to only 83,391 gross tons, which is the smallest production in the States since 1897. The record production was 112,772 gross tons, in 1902. It is obvious that the increased demand for steel for such purposes as formerly called exclusively for crucible steel, should call for a heavier production, had not other varieties of steel come to be used for certain purposes. For years it has been held that the acid open-hearth steel furnace could produce steel of good enough quality to meet the bulk of the demand which was formerly met by crucible steel. In some quarters, says the Iron Trades Review, the surprise may be more that the crucible process has shown such vitality, than that it has not had a greater expansion.

Dr. Samuel Rideal has been criticising the management of the National Physical Laboratory in carrying out testing work for manufacturers in return for fees. He claims that if the Laboratory is to carry out the purpose for which it was founded, its researches, to be of any real value to the nation, must be conducted under the supervision and guidance of experts possessing special knowledge of particular industries. He urges that the Government should only find further funds for the laboratory on condition that its energies are exclusively confined to research work and the standardisation of scientific instruments formerly done by Kew; also that all researches made thus at the public expense be published for the benefit of the nation, and not privately for any individual.

or firm. At the recent meeting concerning the future of the laboratory a statement of the aims and wants of the institution was made by Dr. Glazebrook, who remarked that the main portion of its work was the making of experiments that were required by engineers and manufacturers. The need for such experiments could only be fully realised by those who studied engineering progress. Their resources were hopelessly inadequate for the work they were asked to do. A statement had been drawn up and put before the Government asking for a grant of £30,000 for expenses and equipment of buildings, and for an annual grant of £10,000 a year. The Treasury had granted them £5,000 this year, and the annual grant had been raised to £6,000. That, however, was not sufficient for the work. The laboratory was a national institution; it did not in any way come into competition with the local institutions; it was a necessary adjunct to the whole of their work.

In the presidential address of the Hon. Wm. Knox, M.P., at the annual meeting of the Melbourne Chamber of Commerce, sounds a note of congratulation on the reduction of the postal rate to one penny from Great Britain, and twopence home, permitting as it does the freer interchange of information, but regret is expressed that the Customs Department is precluded from allowing the distribution of business circulars and information without the payment of a harassing and quite unremunerative import duty. The Council of the Melbourne Chamber of Commerce have strongly supported the resolution adopted by the London Chamber of Commerce in favour of obtaining a withdrawal of the regulations imposing a duty on single copies of catalogues, price lists, and circulars. They have expressed their belief that the imposition of such duty, "while causing infinite trouble to the Postal Department and not bringing in any appreciable revenue, will be productive of great annoyance and loss of information to the mercantile com-

munity." The Department, however, replied, in cold official language, that it was not the intention of the Minister to discontinue collecting the duty on catalogues and price lists received from abroad, so we suppose that this very stupid regulation will continue in force until its blighting influence becomes apparent to the official mind, or until it succumbs to the pressure which ought to be brought to bear upon that mind by the injured manufacturers of this country.

We were wondering what the first report (1903-4) of the University of Leeds had to do with July, 1905, when we observed these significant italics:—

"The issue of this report has been unavoidably delayed beyond the end of the period which it reviews. Important events which have occurred in the meantime will be most appropriately alluded to in the Second Annual Report of the University."

Pending the issue of this further report it is satisfactory to note that the special interests of this University are not likely to suffer from the greater freedom which has been conferred upon it as a separate and independent foundation. As a college it had acquired a wide reputation for its advanced teaching in various branches of applied science, some of which were peculiar to itself among the Universities and University Colleges of Great Britain. While fostering learning in its widest sense, so far as opportunity will allow, the University of Leeds will probably find a special mission in developing that scientific work of practical utility which was commenced by the Yorkshire College. The constitution of the University has been drawn so as to make it a county institution in fact, whatever its name. All parts of Yorkshire, outside the sphere of influence of Sheffield, have been recognised as entitled to a voice in its government, and its business [is in effect] conducted by representatives from all parts of the county.

PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the
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and Shipbuilding Industries.

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Alterations, &c., intended for insertion in the current week's issue must be delivered **not later than 4 p.m. on Monday.** If proofs are required the copy and blocks should reach us several days earlier.

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NEWS ITEMS.

A PROJECT for a ship canal from Georgian Bay to Toronto is again being brought forward. The cost of the new scheme is estimated at £7,000,000, while three-fifths of the time occupied in locking would be economised.

The ingots and castings produced in Canada in 1904 amounted to 148,784 gross tons, against 181,514 tons in 1903, a decrease of 32,730 tons. Almost all the open-hearth steel reported in 1903 and 1904 was made by the basic process. The direct steel castings made in 1904 amounted to 6,505 tons.

The death is announced of Mr. William Black, the founder of the Black, Hawthorn, and Co.'s engineering works, Gateshead. Mr. Black, who was in his eighty-third year, was also connected with the North-Eastern Foundry, South Shields, the United Alkali Company, and Tyne industries generally.

A Japanese officer, who has just returned to Tokio from Port Arthur, states that the extent of the damage done to the sunken Russian ships there, is much less than was generally anticipated. The *Bayan* and the *Peresviet* will soon be brought to Japan to complete repairs, the *Palada* is expected to be refloated by the middle of August, and the *Retvisan* and the *Pobieda* will also be shortly raised and fitted for service.

The Aero Club of Belgium, in co-operation with the Belgian Government, assisted by the municipality of Brussels, have organised for Sunday next an international long-distance balloon race, in which twenty-five balloons, belonging to various countries, will compete. England will be represented by the balloon Vivienne III., belonging to Mr. Leslie Bucknall, of the Aero Club of England, who will be accompanied by Mr. Ernest Bucknall and Mr. Perceval Spencer.

CONTENTS.

PAGE	PAGE
Editorial Notes (<i>Illustrated</i>)	113
News Items	118
High Speed Engines on the	
Curels System	121
Shipbuilding Notes	122
Obituary	122
The British Association—Programme of South African Meeting	123
Electrical Engineering in New South Wales	127
Summer Meeting of the Institution of Naval Architects (<i>Illustrated</i>)	128, 138
Boiler Explosions—A Dangerous Firebox	139
The Rapid Electro-Deposition of Copper. By Sherard Cowper-Coles (<i>Illustrated</i>)	130
Power Station Notes	134
Our Weekly Biography: Mr. R. W. Dana, M.Inst.C.E., F.R.G.S. (<i>Portrait</i>)	135
96-in Planing Machine. By William Sellers and Co. (<i>Illustrated</i>)	136
Electric Travelling Hoist by the Niles-Bement-Pond Company (<i>Illustrated</i>)	137
The Report of the London Traffic Commission	147
Contractors' News	155
Share List	157
Home Metal Market (<i>Chart</i>)	160
Prices Current	161
Selected Patents (<i>Illustrated</i>)	166
New Publications	168
Books Received	168
New Catalogues	168

British Electric Traction Company.

The report of this important company is a somewhat voluminous document, containing as it does details as to the manner in which the company has dealt with its many interests. The profit and loss account shows a total sum to credit of £267,175, and the ordinary shares are to receive the moderate distribution of 6 per cent. This is the same rate as for the previous financial year, but the accounts that suggest larger appropriations to reserve and a smaller dividend on the ordinary capital would be sounder finance, and in the permanent interests of the undertaking. At the same time, it is only fair to point out that a considerable proportion of the capital is employed in extensions or new schemes in various stages of preparation, which should contribute more largely to future revenue. The profitable results of the Auckland undertaking may no doubt be taken to indicate that the company is likely to seek future outlets for its enterprise outside the United Kingdom. The formation of the British Automobile Development Company marks the definite adoption of the policy of providing motor omnibus services as feeders to the tramway systems. The total issued share capital of the company now amounts to £2,947,380, and debenture stock has been created to an amount of £1,827,443. Additions to capital during the year represent about £485,000, against which temporary loans to the amount of £200,000 have been paid off.

We are glad to hear that the fire which occurred in the painting and finishing shop of Messrs. Thomas Robinson and Son, Ltd., at Rochdale, has not in any way interfered with the business of the company. The reports of the matter appearing in the daily press were, we are assured, very much exaggerated. The inconvenience caused by the outbreak, which happened early in the morning on Sunday, the 9th inst., was trivial, and by the 11th inst. everything was again in working order in a temporary location pending the reconstruction of the painting and finishing department.

A general meeting of the South Wales Institute of Engineers was held at Cardiff on Thursday, the following papers being taken as read: "A High Speed Electrically Driven Compressor for Colliery Work," by Mr. W. W. Reavell; "Timbering and Arching in Mines," by Mr. W. Idris Thomas; and "Economic Working of Boilers," by Mr. Strohmeier. The following papers were opened for discussion: "Some Economic Aspects of Electrical Power Distribution," by Mr. E. L. Hill, M.Inst.C.E., A.M.I.E.E.; "Paper on the Government Mines, Sadong-Sarawak, Borneo," by Mr. B. Hort Huxham; "Caps or Attachments for Winding Ropes," by Mr. W. H. Becker.

The Labour Market in June.

Board of Trade statistics regarding employment generally in June showed little change as compared with May. Compared with a year ago there was an improvement in the metal, engineering and shipbuilding trades. In the 271 trade unions, with an aggregate membership of 570,346, making 29,995 or 5·2 per cent., were reported as unemployed at the end of June, 1905, as compared with 5·1 per cent. at the end of May, 1905, and 5·7 per cent. in June, 1904.

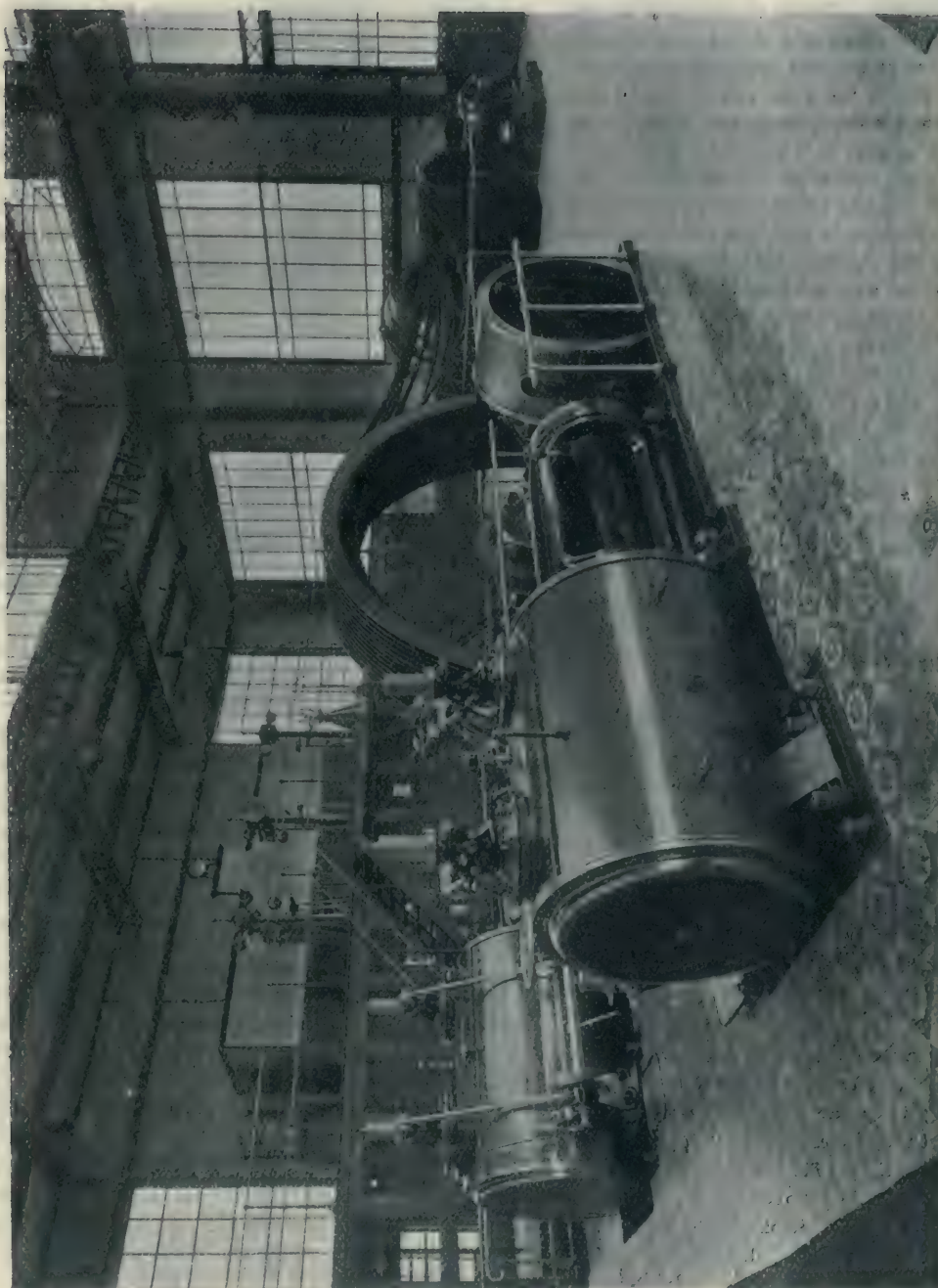
In the engineering trades employment generally showed a slight further improvement, and was considerably better than a year ago. Returns relating to 143,165 members of trade unions show that 7,317 (or 5·1 per cent.) were unemployed at the end of June, as compared with 5·2 per cent. in May, and 6·7 per cent. in June, 1904. The percentages for the various districts are shown in detail in the following table:—

District.	No. of Members of Unions at end of June, 1905, included in the returns.	Percentage returned as Unemployed at end of			Increase (+) or Decrease (—) in percentage unemployed for June, 1905, as compared with a	
		June, 1905.	May, 1905.	June, 1904.	Month ago.	Year ago.
North-East Coast	13,630	5·6	5·1	8·4	+ 0·5	— 2·8
Manchester and Liverpool District	17,955	5·4	5·7	7·0	— 0·3	— 1·6
Oldham, Bolton, and Blackburn District	11,805	4·2	5·3	10·5	— 1·1	— 6·3
West Riding Towns	11,772	6·6	7·2	8·4	— 0·6	— 1·8
Hull and Lincolnshire District	3,431	2·5	2·5	6·3	...	— 3·8
Birmingham, Wolverhampton, and Coventry District	6,535	3·6	4·0	4·3	— 0·4	— 0·7
Notts, Derby, and Leicester District	3,935	5·9	7·2	6·4	— 1·3	— 0·5
London and Neighbouring District	12,103	4·0	4·2	4·2	— 0·2	— 0·2
South Coast	3,907	4·9	3·8	1·5	+ 1·1	+ 3·4
South Wales and Bristol District	6,455	4·0	4·6	4·5	— 0·6	— 0·5
Glasgow and District	12,683	9·4	8·3	9·6	+ 1·0	— 0·2
East of Scotland	3,714	8·5	7·5	11·5	+ 1·0	— 2·7
Belfast and Dublin	3,119	6·4	6·6	7·2	— 0·2	— 0·8
Other Districts	5,437	4·0	5·0	4·8	— 1·0	— 0·3
United Kingdom (Including certain Unions for which district figures are not available)	143,165	5·1	5·2	6·7	— 0·1	— 1·5

The percentage of unemployed was greatest in Scotland, the West Riding towns, and the Belfast and Dublin district, while it was least in the Hull and Lincolnshire district, and the West Midlands.

As compared with a month ago, most districts showed some improvement, which was greatest in the Oldham, Bolton, and Blackburn and Notts, Derby, and Leicester districts; there was some decline on the South Coast and in Scotland.

As compared with a year ago, there was a considerable decline on the South Coast, but every other district showed an improvement, the falling-off in the number of unemployed being greatest in the Oldham, Bolton, and Blackburn, Hull and Lincolnshire, North-East Coast, and East of Scotland districts.



Photo, Rooker and Sullivan.]

CONTINENTAL POWER STATIONS—INSTALLATION OF THE SOCIÉTÉ NORMANDE D'ÉLECTRICITÉ AT ROUEN.

The installation at this station consists of a tandem engine of 1,200 h.p., constructed by Carols Frères, and having the following principal dimensions: Diameter of h.p. cylinder, 27 in.; diameter of l.p. cylinder, 43½ in.; piston stroke, 45½ in.; speed, 94 revolutions. The engine works condensing with superheated steam at 575 deg. F. and 150 lb. pressure. It is connected with an alternator running triphase at 50 periods per second.

HIGH-SPEED ENGINES ON THE CARELS SYSTEM.

WE illustrate on the opposite page the installation at the Normandy Lighting Supply Company's station at Rouen, consisting of a tandem engine of 1,200 h.p., constructed by Carels Frères, Ghent (Belgium), and having the following principal dimensions: Diameter of n.p. cylinder, 27 in.; diameter of l.p. cylinder, 43½ in.; piston stroke, 45½ in.; speed, 94 revolutions. The engine works condensing with superheated steam at 575 deg. F. and 150 lb. pressure. It is connected with an alternator running triphase at 50 periods per second.

In connection with this installation Carels Frères have erected a cross compound engine of 650 h.p., having 22½ in. and 35 in. diameters of cylinders and 29½ in. stroke; speed, 125 revolutions. It works under the same conditions as the engine referred to above, being connected up with an alternator. This engine with alternator is mainly designed to supply the day load; for the peak load, the whole of the station plant installed here, with that of an older station in the same town which is equipped with two 1,000 h.p. Carels engines, is drawn upon.

The features of the engines are claimed to be silent work and freedom from shock, thus giving facilities for successful parallel working. By the use of a superheater considerable economy with steam consumption has been effected. Official tests are stated to have shown a consumption of 10 lb. of steam per h.p. hour. Other electrical stations which have been equipped by Carels Frères include an electric tramway station at Merxem-lez-Anvers, electric lighting station at Anvers, Brussels, Nancy, Nantes, Le Havre, Reims, Amiens, Bordeaux, Kazan, Belgrade, etc. Of recent years high-speed engines have been greatly in demand for direct connection to electrical generators, in order to reduce the floor space occupied, particularly in case of installations for electric light or long-distance power transmission, for electric traction and other purposes, and in this connection Messrs. Carels Frères, of Ghent, designed a new type of cross compound tandem and double tandem engine for direct attachment to dynamos.

These engines are provided with a special gear which permits of the rapid opening and closing of the valves without any impairment of their durability.

They are very strongly constructed for high pressure, and fitted with a powerful governor which regulates to a constant speed with those sudden changes of load which occur in traction stations, and avoids appreciable variation of the electrical potential. These engines are built from 400 to 4,000 h.p.

The superheater filled consists of a bundle of solid drawn steel tubes, free to expand, placed behind the boiler or in the flue close by it. A portion of the gases pass to the superheater, the remainder going on through the boiler flues, whereby the gases are employed to the best effect. A special arrangement has been adopted to avoid the exposure of the tubes to an excess of temperature. Installations made during the last seven years are said to have shown that no deformation of the superheater takes place, and there is no reason why superheaters should be less durable than boilers.

A thermometer registers the temperature of the steam at the outlet of the apparatus and enables the stoker to regulate the temperature of the steam just as he regulates the pressure by watching the pressure gauge. The draught through the superheater can, it is claimed, be easily regulated.

Messrs. Carels claim to have been the pioneers of superheated steam engines in Belgium and France, and they are stated to have supplied engines for superheated steam to the extent of over 80,000 h.p. They have recently supplied to the collieries of Grand Hornu, near Mons (Belgium) two tandem compound engines, running at 84 revolutions per minute, developing a power of 4,000 h.p., and connected with a triphase alternator of the General Electrical Company, Berlin. This station is one of the first which was designed to meet the special requirements of coal mining, and has proved a distinct success.



SWITCHBOARD SHOPS, SHOWING BACK OF BRISTOL H.T. BOARD IN COURSE OF CONSTRUCTION.

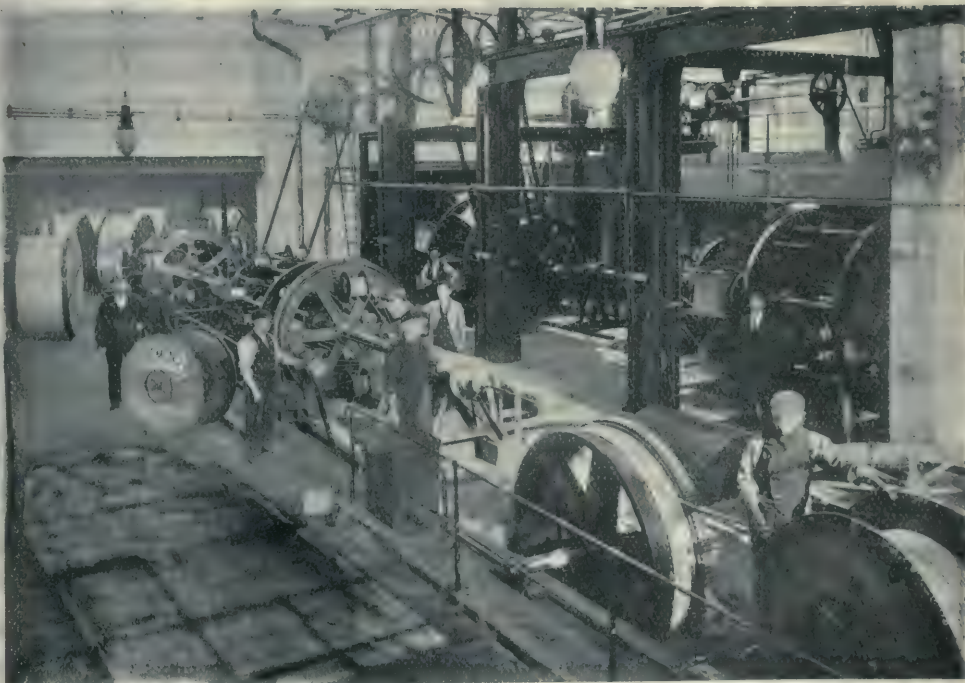


TESTING-TANK, LEAD CABLE SHOP.

VIEWS IN THE WORKS OF MESSRS. SIEMENS, BROS. AND CO., LTD.



LEAD PRESSES.



LAYING UP MACHINERY FOR TELEPHONE CABLES.

VISITED BY THE INSTITUTION OF NAVAL ARCHITECTS ON JULY 19th.

THE BRITISH ASSOCIATION.

PROGRAMME OF SOUTH AFRICAN MEETING.

TO-MORROW, the *Durham Castle* and *Kildonan Castle* sail for South Africa, carrying, respectively a complement of 108 and 45 members of the British Association. On Saturday, July 29th, the *Saxon* sails with 139 members, who constitute the official party, and are the guests of the South African Colonies. With earlier departures, the total number proceeding to the meeting will be nearly 400.

CAPE TOWN.

The *Saxon* arrives at Cape Town (early morning) on Tuesday, August 15th, and the work of the Association commences forthwith. A meeting of the Council will take place at noon, and the eleven Sectional Committees and the General Committee will also foregather.

The President's Address to the Association will be delivered (in part) at the inaugural meeting to be held in the evening.

In this, Professor Darwin proposes to discuss the general principles involved in theories of evolution, with special reference to the world of inanimate matter. He will illustrate the subject by means of various theories of the intimate constitution of matter and of cosmical evolution.

August 16th.—Presidential Addresses to Section A, Mathematics and Physics; Section D, Zoology; Section E, Geography; Section F, Economic Science and Statistics; Section H, Anthropology; and Section L, Educational Science.

In the afternoon a garden party will be given by his Excellency the Governor (Sir Walter F. Ely-Hutchinson); in the evening there will be a reception by the Mayor of Cape Town.

August 17th.—Sectional meetings.

In the evening Prof. E. B. Poulton, F.R.S., delivers a lecture on "W. J. Burchell's Discoveries in South Africa."

August 18th.—Sectional meetings.

In the evening Mr. C. V. Boys, F.R.S., delivers a lecture on "Some Surface Actions of Fluids." Following this a conversazione will be given by the combined scientific societies of Cape Town, at the South African Museum.

In the afternoon, Sir David Gill, K.C.B., F.R.S., will give a reception at the Royal Observatory.

The *Saxon* leaves for Durban (evening).

August 19th.—Whole day excursions to, among other places of interest: Table Mountain; De Beers Explo-

sive Works; Hout Bay; Admiralty Works, Simon's Town; Marine Station, St. James's.

The *Durham Castle* leaves for Durban direct, arriving in the forenoon of Tuesday, August 22nd.

DURBAN.

August 22nd.—A lecture will be delivered in the Town Hall in the evening by Mr. Douglas Freshfield, F.R.G.S., on "Mountains: the Highest Himalaya."

In the afternoon there will be a garden party at Sir Benjamin Greenacre's.

August 23rd.—Visit to Botanic Gardens; trip (full day) to Umkomaas; circular trip round the Bay; inspection of Girls' Model Primary School; Mount Edgecombe (Sugar Estate); Parade of Cadets.

PIETERMARITZBURG.

August 24th.—Leave Durban for Pietermaritzburg, by special trains (morning). In the evening, Colonel David Bruce, C.B., F.R.S., will deliver a lecture on "Sleeping Sickness."

In the afternoon will be held a garden party.

August 25th.—Visits to the Museum, Educational Institutions, and Public Buildings generally.

Excursion to Native Location, Henley, with Kaffir dance; Government Experimental Farm, Codara; Government Laboratory, Ailerton; Town Bush Valley Nurseries.

August 26th.—Leave Pietermaritzburg by special trains for a visit to Colenso; sleep in the special trains; leave for Ladysmith August 27th (Sunday) and visit the town; depart same day for Johannesburg.

JOHANNESBURG.

August 28th.—In the evening a lecture will be delivered by Prof. W. E. Ayrton, F.R.S., on "The Distribution of Power."

August 29th.—Sectional Meetings. Presidential Addresses to Section B, Chemistry; Section C, Geology; Section G, Engineering; Section I, Physiology; and Section K, Botany. A Report by Mr. G. W. Lamplugh, F.R.S., on "the 'Geology of the Victoria Falls,'" will take the form of an afternoon address to Section C.

In the afternoon a garden party will be given by his Excellency the High Commissioner for South Africa (the Earl of Selborne, G.C.M.G.); in the evening there will be a reception by the Mayor and Town Council of Johannesburg.

August 30th.—Sectional Meetings (morning); visit to Mines (afternoon).

In the evening Prof. G. H. Darwin will deliver the second portion of the Presidential Address in St. Mary's Hall.

PRETORIA.

August 31st.—Visit to Pretoria.

In the evening a lecture will be delivered by Mr. A. E. Shipley, F.R.S., on "Fly-borne Diseases, Malaria, etc."

A garden party will be given by his Excellency the Lieutenant-Governor (Sir Arthur Lawley, K.C.M.G.). Visits will be paid to the Museum and Zoological Gardens, and other places of interest. A luncheon will be given by the Mayor and Town Council of Pretoria. Excursions can be made to the Dynamite Factory, Modderfontein, and the Premier Diamond Mine.

The President and most of the members will sleep at Pretoria, but the Sectional officers return to Johannesburg in the evening by special train.

JOHANNESBURG.

August 31st.—In the evening a lecture will be delivered by Prof. J. O. Arnold on "Steel as an Igneous Rock."

September 1st.—Sectional Meetings (morning); General Committee (afternoon).

In the afternoon there will be a Kaffir dance at the Wanderers' Club. During the Johannesburg visit various excursions will be made, and visits of inspection paid to Public Buildings and to the Government Experimental Farm, Potchefstroom. There will also be a cross-country trip for a limited number to Mafeking.

BLOEMFONTEIN.

September 2nd.—A lecture will be delivered in the evening by Mr. A. R. Hinks, on "The Milky Way and the Clouds of Magellan."

A public welcome will be extended to the Association by the Mayor and Town Council of Bloemfontein, and there will be a reception at Government House.

September 3rd (Sunday).—Special train to Modderpoort, stopping at Sannah's Post; lunch on board the train, provided by the hospitality of the town. A trek to Kimberley will be arranged for a limited number, touching Driefontein and Paardeberg, and camping in General Cronje's old laager.

September 4th.—Leave Bloemfontein by special trains for Kimberley.

KIMBERLEY.

September 5th.—In the evening a lecture will be delivered by Sir William Crookes, F.R.S., on "Diamonds."

Underground visits to mines (in parties) will be made. There will be a garden party at the Public Gardens.

September 6th.—In the evening a lecture will be delivered by Prof. J. Bonsall Porter, of Montreal, on "The Bearing of Engineering on Mining."

In the morning the whole body of visitors will en-train at Kimberley for Beaconsfield, thence to De Beers Sidings, and will proceed by rail to Du Toit's Pan and Wesselson Mines. Trips will be made to Kenilworth, Pulsator, and Alexandersfontein.

September 7th-8th.—Leave Kimberley *en route* for Bulawayo (official party).

BULAWAYO.

September 9th.—In the evening a lecture will be delivered by Mr. Randall MacIver on the "Zimbabwe."

In the course of the morning and afternoon the Public Buildings, Memorials, and Museum will be inspected; in the evening a conversazione will take place in the Drill Hall.

September 10th (Sunday).—Leave for Matopos by train; travel by coach through the Matopos to the World's View. Inspect Rhodes Park, the site of the grave of Mr. Cecil Rhodes, Shangani Memorial, and the Khami Ruins, and return to Bulawayo.

September 11th.—Official party leaves for Victoria Falls.

September 12th.—Arrive at Victoria Falls; visit the Palm Grove, Rain Forest, Zambesi Bridge, etc.

September 13th.—Leave Victoria Falls (morning) for Bulawayo.

September 14th.—Official party arrives at Bulawayo (early morning). Garden party in South Park (afternoon). Official party leaves for Cape Town (evening), arriving Sunday, September 17th (afternoon).

September 20th.—The official party, homeward bound, leaves for England, arriving at Southampton on Saturday, October 7th.

Members who are returning to England by the beira route leave the Victoria Falls, September 14th, and embark on the *Durham Castle* on Sunday, September 17th. The ports of call are: Mozambique, Zanzibar, Mombasi (Kilipini), Port Said, Marseilles, and Southampton, the last-named being reached on October 20th.

TABLE OF DISTANCES.

	Miles.
Southampton to Cape Town	5,978
Cape Town to Johannesburg	1,013
Cape Town to Bloemfontein	750
Cape Town to Kimberley	647
Cape Town to Bulawayo	1,362
Bulawayo to Victoria Falls	275

SHIPBUILDING NOTES.

On the 14th inst. the new steel screw steamer *Parklands*, recently launched by Irvines' Shipbuilding and Dry Docks Company, Ltd., West Hartlepool, and built to the order of Mr. R. Hardy, West Hartlepool, proceeded to sea for her trial trip. She is of the following dimensions: 351 ft. by 48 ft. by 23 ft. 2 in. The vessel is built to Lloyd's highest class, under special survey, and is of the single deck type, having poop, extra long bridge, and top-gallant forecastle. A double bottom is fitted throughout on the cellular principle, and the fore and after peak tanks are arranged as trimming tanks. She is constructed with bulb angle frames, web frames, and longitudinal stringers, giving clear holds for the storing of bulky cargoes. Six water-tight bulkheads divide the holds into seven water-tight compartments, and wood grain divisions are fitted in the holds. Engines of the triple-expansion type have been supplied and fitted by Messrs. Blair and Co., Ltd., Stockton, having cylinders 23½ in., 39 in., and 64 in. by 42 in. stroke. There are two large single-ended boilers, giving 180 lb. pressure. At the trial trip a mean speed of eleven knots was obtained, the engines working smoothly and well, and the vessel having a full cargo on board. She has proceeded on her maiden voyage to Alexandria.

At Alloa on the 13th inst., Messrs. Mackay Brothers launched the twin-screw ferry steamer *Hope*, built to the order of Messrs. McLeod and Sons, Alloa. The vessel is 53 ft. b.p. by 23 ft. by 5 ft. 5 in. moulded depth, and is fitted with two sets of engines having cylinders 7 in. and 14 in. by 10 in., with boilers 6 ft. 6 in. diameter by 8 ft. long, giving 120 lb. working pressure. The machinery has been supplied by Messrs. Aitchison, Blair and Co., Clydebank. The *Hope* is intended for an improved ferry service between North and South Alloa, and has been specially designed for vehicular traffic. The deck area gives accommodation for 300 passengers. The vessel was named by Miss Mackay, Grange, Alloa.

On the 10th inst. the s.s. *Glenmay*, built by Messrs. Ropner and Son, of Stockton-on-Tees, for Messrs. R. Livingstone and Co., of West Hartlepool, made her official trial trip in the Tees Bay. The vessel is 322 ft. in length, with a deadweight carrying capacity of about 4,400 tons, and is classed 100 A 1 at Lloyd's. The engines are of the triple expansion type, of about 1,200 h.p., by Messrs. Blair and Co., Ltd., of Stockton-on-Tees. The steamer made a very satisfactory trial trip, during which a speed of eleven knots was attained, and afterwards proceeded to the Tyne to load for Barcelona.

OBITUARY.

The death of Sir Peter Nicol Russell, at the advanced age of eighty-nine, is noted with keen regret. He was the son of Mr. Robert Russell, of Kirkcaldy, but went to Australia as a young man, and built up a large shipbuilding works at Sydney, under the title of P. N. Russell and Co. It will be remembered that he endowed the Nicol Russell School of Engineering in Sydney University.

Sir Wm Muir, who was for nearly twenty years the President of Edinburgh University, and whose death has just been announced, was in many respects a remarkable personality. He lived to see eighty-six years, and the secret of his longevity, as he himself had often stated, was hard work and exercise. He used to rise at an abnormally early hour, both when in India, where he was in the Bengal Civil Service, and in this country, to take riding exercise. In his capacity of

President of the Edinburgh University he did a great deal for the cause of education in Scotland, and took the liveliest interest in all matters affecting the well-being of students. He will long be held in affectionate remembrance.

The death is reported from Cape Town of Mr. John Brown, C.E., C.M.G., Engineer-in-Chief of the Cape Government Railways. He was born in 1844, and served his articles with the late Sir John Coode, at Portland Breakwater, being afterwards employed as junior assistant-engineer on the Bristol and Exeter Railway under Mr. Francis Fox. Subsequently, Mr. Brown was engaged as superintending engineer of the River Bann Navigation Works, Ireland, under the late Sir John Coode, and in 1873 entered the service of the Cape Government Railways as assistant-engineer under the late Mr. H. I. Pauling. He was made a C.M.G. in 1902.

ELECTRICAL ENGINEERING IN NEW SOUTH WALES.

AN Australian correspondent sends us a copy of Mr. T. Rooke's presidential address to the members of the Electrical Association of New South Wales. This, though somewhat belated, is worth quoting as reflecting the condition of the electrical industry over there. Mr. Rooke remarks that the past year in New South Wales has seen the inauguration of a municipal electric light system in Sydney, and the introduction of the steam turbine for the generation of electricity for the Government tramways. It has seen the inauguration of tramways in Dunedin and Auckland, the commencement of tramway systems in Christchurch and Fremantle, and a high lift pumping plant for the Moonta mines in South Australia.

Progress has also been made in electric lighting, by the extended use of lamps using about 50 per cent. less electricity per candle power than former patterns of lamp. To the Nernst lamp and small arc lamp have been added the Tantalum lamp and the Osmium lamp. Specimens of the former have already reached Sydney, and although there is no extensive experience with them here at present, the quality of the light is excellent, and they may be expected to diminish the cost of electric light in private dwellings by at least 25 per cent. The inauguration of the City Council's supply system gives promise of demonstrating that the production of cheap electricity from coal is practicable in Australia for industrial purposes, and the introduction of the steam turbine is a distinct step advancing in the direction of cheap electricity.

It is when Mr. Rooke comes to the existing industrial conditions that he calls a halt for a careful and systematic survey. Here is a vast country, as big as Europe, with enormous agricultural, and mineral resources, with barely five millions of inhabitants, yet there are many who are in need of employment and cannot

obtain it. The cause of this is not scarcity of capital, but simply that capital cannot see profits under present conditions. In the course of further observations the president remarked that, judging from the condition of the engineering trade in New South Wales, things were not going uphill as they should. A modification of the hostile and exacting attitude of the workers would do much to mend matters. The very mention of union suggested exaction and inefficiency at the present time.

If the electrical engineers formed a union, he hoped they would profit by the mistakes of the past, and would endeavour to promote the industry. So far as he could judge, the technical training in Australia was excellent; but additional factories were required. With regard to the future, it was good for them to look around and consider how much was being done elsewhere. A number of high voltage transmission lines supplying power at distances of from 50 to 230 miles away from the point of generation, had been erected in America, they were also springing up in England and Europe. Single-phase electric traction with trolley line voltages of 6,000 was an accomplished fact. Australia alone, with all its natural resources, remained behind, although in New Zealand, at Waipori, a transmission of thirty-four miles was shortly to be constructed. In conclusion, he urged upon the members of the Association the importance of trying to keep up with the times; of trying to develop and encourage the development of the immense resources of which the country is possessed, by unity of purpose, and by keen, straight, business competition. The President announced his intention of placing £100 at the disposal of the council of the association, the interest to be devoted to the purchase of an annual prize for the best paper contributed by members.

INSTITUTION OF NAVAL ARCHITECTS.

THE summer meeting of this Institution opened at the Society of Arts on Wednesday last, under the presidency of the Earl of Glasgow.

Amongst those attending the meeting were Admiral Sir John Hay, Sir John Durston, Admiral Sir Cyprian Bridge, Sir Philip Watts, Sir Nathaniel Barnaby, Lord Brassey, Sir Wm. White, Sir John Thornycroft, Messrs. C. E. Strohmeier, J. T. Milton, W. H. Whiting, J. H. Cornish, Robert H. Humphrey, J. Orlando, J. Foster King, and J. E. Elmslie, A. F. Yarrow, John Corry, Admiral Fremantle, and Captain R. H. Bacon.

Admiral Sir Cyprian Bridge, in his paper on naval strategy and tactics at the time of Trafalgar, stated that, looking back at the tactics in the time of Trafalgar, history confirmed the experience of earlier wars—viz., that victory did not necessarily fall to the side which had the biggest ships. It remained to be seen how far the occurrences in the recent battle of the Japan Sea would support or be opposed to this conclusion, but it might be said that there was nothing tending to upset it in the previous history of the present war in the Far East. He did not know how far he was justified in expatiating on this point, but it might help to bring the strategy and tactics of the Trafalgar epoch into practical relation with the naval science of our own day. Recent development in naval construction aimed at producing more powerful ships, but to a meeting of naval architects he would point out that in adopting such a tactical system the principle of concentration of superior numbers must be abandoned. This would compel a reversion to tactical methods which would make a fleet action a series of duels between pairs of combatants, and which never enabled any admiral to win a decisive victory. At the same time, he did not ignore the merits of the battleship class. Like their predecessors, the ships of the line, they dominated the situation.

The second paper was "The Ships of the Royal Navy as they existed at the time of Trafalgar," by Sir Philip Watts. The author pointed out that since the days of Trafalgar, steam propulsion in its varied forms, shell fire, iron and steel armour, steel hulls, breech-loading and rifled guns, torpedoes, mines, high explosives, and electrical appliances had all been introduced; but, while they had often threatened, they had still left intact the supremacy of the big gun in

the big ship. The weight of the big gun had increased from $3\frac{1}{2}$ tons to 111 tons, and the length from 9 ft. 6 in. to over 46 ft., while the muzzle velocity had been raised from 1,500 ft. to 2,700 ft. per second. Since the days of Trafalgar the shipbuilding industry had been moved from the Southern counties to the North.

Mr. J. H. Cornish, chief ship surveyor to Lloyd's Register, contributed a paper on "The Classification of Merchant Shipping," with a short history of Lloyd's Register. He pointed out that, quite apart from the security such an institution afforded to merchants, shipowners, and underwriters, it afforded great assistance to engineers and shipbuilders by bringing together the results of experience and investigation from all quarters.

Some of the papers which deal with naval engineering are reported in greater detail in this issue.

On Wednesday afternoon a visit was paid to the works of Messrs. Siemens Bros. and Co., and we illustrate on pages 122 and 123 some of the shops of this firm. Other visits which took place on Wednesday were to Messrs. Vickers, Sons and Maxim's ordnance works, Erith, and to the refrigerating machinery works of Messrs. J. and E. Hall, of Dartford.

Wednesday evening was devoted to the reading of the two papers on influence of depth of water on speed, reported at length in this issue, and a paper on "Experiments with models of constant length and form of cross sections, but with varying breadths and draughts," by Lieut.-Colonel B. Rota.

On Thursday morning Mr. J. T. Milton read an important paper on "The Failure of some Large Boiler Plates," with a valuable appendix containing the report of Prof. Arnold; and Mr. Wm. Gray submitted a paper, "A Comparison of the Performance of Turbines and Reciprocating Engines in the Midland Railway Company's Steamers," which is reported in this issue.

A pleasant function took place on Thursday afternoon, when the members of the Institution visited Tilbury Docks on the invitation of the chairman and directors of the P. and O. Steamship Company. Luncheon was served on board the R.M.S. *India*. There were also visits to the works of Messrs. Yarrow and Co., Poplar; Messrs. Thornycroft and Co., Chiswick; and to H.M.S. *Black Prince*, now fitting out in the Victoria Dock.

Last night the social side of the session was emphasised by a conversazione at the Royal United Service Institution.

To-day a visit to Portsmouth Dockyard takes place.

(Continued on page 138.)

BOILER EXPLOSION.

A DANGEROUS FIREBOX.

A RECENT Board of Trade report deals with the explosion from a vertical boiler used on a farm near Nottingham, which apparently might have been avoided if the boiler had been occasionally examined by an expert.

The firebox fractured on the right-hand side of the fire-door and level with the same, the lower portion of plate, which measured 7 in. by 13 in. being blown clean out, and the upper portion turned upwards against the cross-tube.

The reaction of the outflow of the contents of the boiler through the aperture thus made tore the boiler from the bedplate to which it was fixed and projected it through the roof of the lean-to shed which formed the engine-house. In falling, the boiler alighted on a cornstack near to, and from there rolled off on to the ground. The stack was set on fire, but this was extinguished with a few buckets of water. The steam gauge was also damaged.

The explosion was due to wasting of the plate, the firebox having been reduced in thickness to such an extent by corrosion on the fire side as to be unfit to resist the pressure of steam on the boiler at the time. This was stated to have been 50 lb.

The farmer had no practical knowledge of engines or boilers, and nothing was said at the time of purchase (second-hand) as to the working pressure the boiler was fit for, neither was any expert called in to inspect the boiler. Two sons, assisting in the work of the farm, were given charge of the newly-acquired machinery, but as they, like their father, had no practical knowledge of the working and care of the same, a man, who drove a locomotive engine in the district and who occasionally did odd jobs about the farm, was engaged to give them a few hints as to their working.

The boiler was only under steam occasionally. During the winter it was used once a week — one week for four or five hours for chopping and grinding, the other week for about one and a half hours for chopping only. In the intervening time it was not emptied, except once a month for cleaning. In the summer time the boiler was only used once a month for about one and a half hours, and during the intervening time it was emptied. It was the practice to fill the boiler through the safety valve

opening by removing the valve and weight and throwing back the lever.

The pressure of steam at which the boiler was worked depended on the work being done. When grinding, 40 lb. was carried, but when chopping, the steam was raised to 50 lb. It was usual to work with the weights of the safety valves at the extremity of the levers, and in this position the valves were said to blow off when the gauge indicated 50 lb.

On the day of the explosion, the work of chopping food was in operation when the engine belt flew off. The elder son immediately stopped the engine, and was in the act of replacing the belt, his brother standing by, when the boiler exploded, with the result previously stated.

When I inspected the boiler after the explosion, writes Mr. Thomas Kendall in his report, I found that the firebox plates had been wasted so thin by corrosion that the boiler was unsafe to work at any useful pressure. The corrosion appeared to have been general and to have taken place wholly on the fire side of the plate, very little, if any, having taken place on the water side; the plates at the lap of the joint on the water side measured fully $\frac{1}{4}$ in., whilst the joining lap on the fire side only measured about $\frac{1}{8}$ in. between the rivets, the corrosion at the rivets not having been quite so excessive.

The wasting of the plates appeared to have been due to dampness through the boiler not having been in regular use, and the accumulation of wet ashes in the ashpit, the latter probably arising from the leakage of feedwater through the division in the bedplate. I also found one of the safety valves stuck fast in its seat by corrosion, and it did not appear to have been in working order for some time.

The owner's sons appear to have taken every care to keep the boiler clean internally and externally, and to have taken a general pride in the appearance of the engine-house, and it is to be regretted that an expert was not called in occasionally to examine the boiler, who would no doubt have detected the dangerous condition of the firebox in time to have averted the disaster, and the inoperative and dangerous condition of the second safety valve. They were indeed fortunate in escaping with their lives, as they were working alongside the boiler when it exploded.

THE RAPID ELECTRO-DEPOSITION OF COPPER.

BY SHERARD COWPER-COLES.

IT has been the aim of electro-metallurgists, ever since copper refining was introduced by Messrs. Elkington in the year 1869, to increase the rate at which the copper can be deposited in a smooth form without any large increase in the voltage. The current density employed in electrolytic refineries has been gradually increased from about 8 or 10 amperes, as employed by Messrs. Elkington's and Elliott's at Birmingham, to 20 amperes per square foot as at present employed at the Anaconda works and the current density will, no doubt, be further increased in electrolytic refining plants in the near future.

Various attempts have been made from time to time to further increase the current density by using mechanical means for keeping the copper from getting rough by rubbing down or smoothing the raised portions. The various processes for accomplishing this end may be classified under four headings: (1) Revolving or moving the cathode; (2) Burnishing the copper during deposition; (3) Insulating the excrescences or growths on the copper, so as to prevent further increase; (4) Rapid circulation of the electrolyte; (5) Revolving the cathode at a critical speed (centrifugal process). Under Class 1 may be mentioned the process of Wilde. Fig. 1 represents the apparatus employed; the cathode is revolved slowly, the anodes being made from copper tubes. In this way an even thickness of deposit is obtained over the whole surface, uniform along the length of the roller, by reason of the motion imparted to the solution, which maintains an equal density of solution throughout, and uniform as to its diameter, because the rotation constantly brings fresh surfaces opposite the anodes. Fig. 2 shows Wylie's and Grant's process; the former is very similar to Wilde's apparatus,

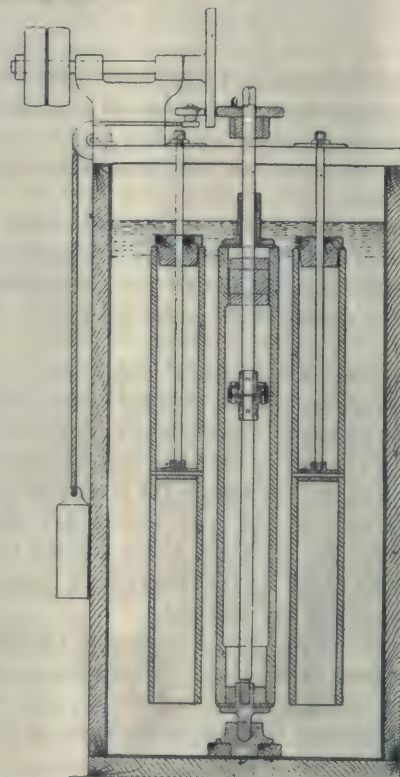


FIG. 1. WILDE'S APPARATUS FOR COPPERING CALICO ROLLERS

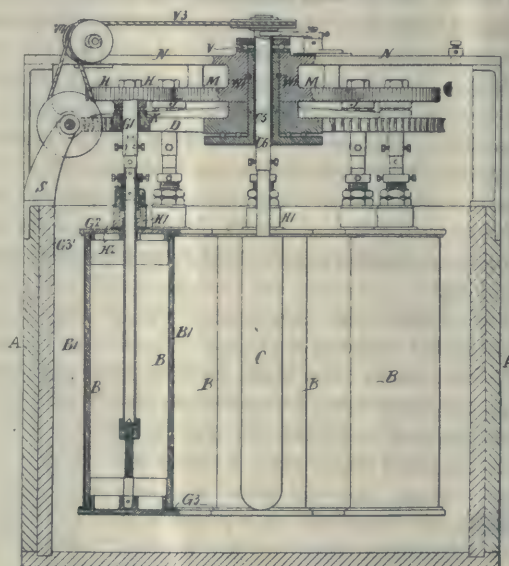


FIG. 2. WYLIE'S AND GRANT'S APPARATUS.

the chief difference in the latter being that both anode and cathode are rotated. The apparatus consists of a vertical central rotating anode, C, the iron rollers to be coated (B) rotate on their own axes by means of the gearing shown in the illustration, and are also caused to revolve around the central anode.

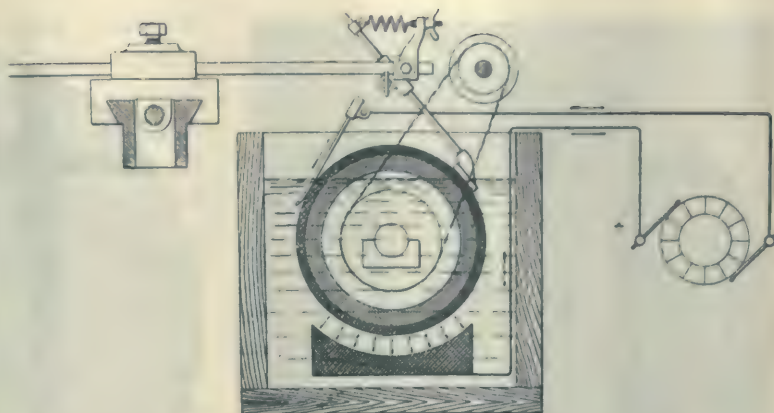


FIG. 3. ELMORE'S PROCESS.

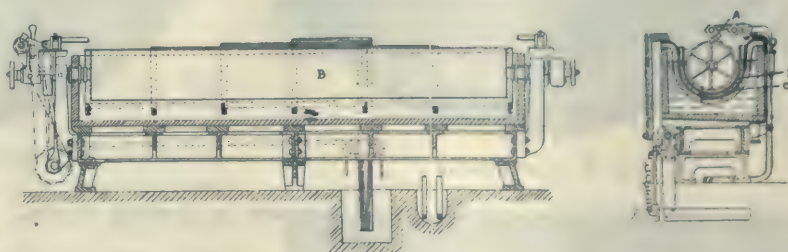
BURNISHING PROCESS.

Burnishing the copper during electro-deposition is the process employed at the factories worked under the Elmore process (fig. 3). The burnishers are of agate; the mechanical arrangement for operating them need not be described. The usual current density

is under 20 per square foot, and the voltage at the electrodes from 0.05 to 1 volt; a 4-in. mandrel is revolved at about thirty revolutions per minute.

Insulating the excrescences or growths on the deposited tubes is the process in which a sheepskin burnisher is substituted for an agate one, smooth deposits being obtained by the application of an insulating coating to the inequalities on the surface.

Figs. 4 and 5 show the construction of the apparatus. The mandrel is revolved in a horizontal position, and about two-thirds of it is immersed in the electrolyte, and the sheepskin burner, A, is caused to travel the whole length of the mandrel by means of the mechanism shown in the illustration. It was found that if a fixed path of reciprocation be followed by the membranes or burnishers, at the points where the reversal of motion takes place, rings are produced upon the cathode. To overcome this defect the point of reversal is gradually



FIGS. 4 AND 5. DUMOULIN'S APPARATUS TYPICAL OF THE INSULATING PROCESS.

shifted, first to the right and then to the left, by means of a suitable worm-wheel and gearing. B and C are perforated plates, which are shaped to the contour of the cathode, and between which the anode metal is placed.

THE CENTRIFUGAL PROCESS.

Electro-metallurgists have known for a considerable time that the rate of electro-deposition can be greatly increased by rapidly circulating the electrolyte or by impinging or injecting the electrolyte against the cathode.

The rapid deposition of copper by impingement of the electrolyte is not likely to be applied commercially until the amount of solution required to be circulated per square foot of cathode can be greatly reduced.

The author when carrying out experiments on the electrolytic production of copper tubes, which should be free from laminations, observed that if the mandrel constituting the cathode was revolved at a certain circumferential speed,

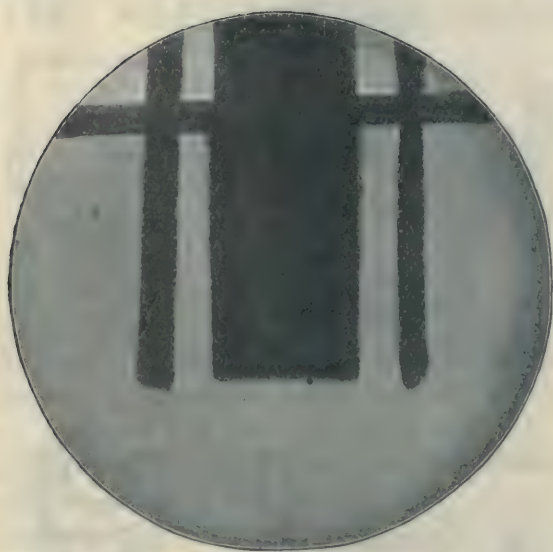
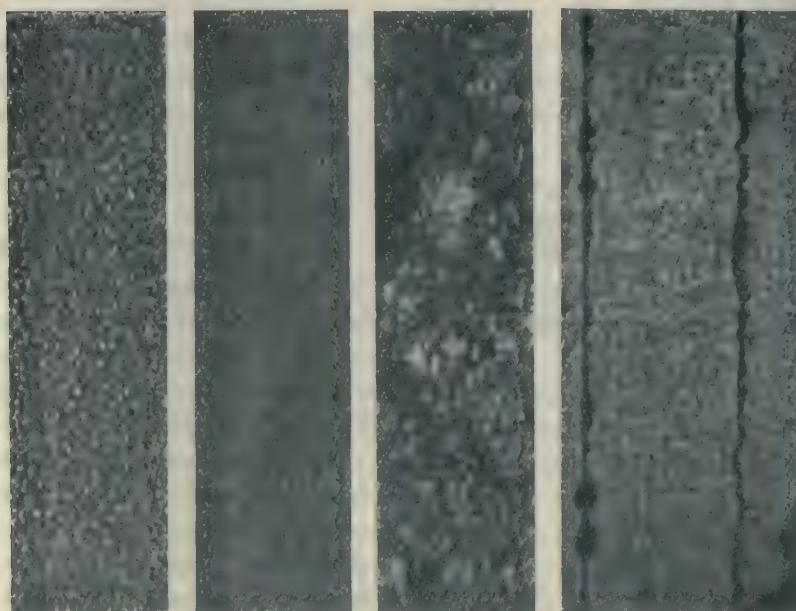


FIG. 6. STATIONARY.



FIG. 7. CRITICAL SPEED.

REVOLVING CATHODES AT VARYING SPEEDS.



A B C
SECTIONS PARALLEL TO SURFACE OF SHEET.
70 DIAMETERS.

FIG. 8. MICROPHOTOGRAPHS OF COPPER
DEPOSITED BY THE CENTRIFUGAL PROCESS.

FISSURE DUE TO
STOPPING OF MANDREL.
SECTION AT RIGHT ANGLES
TO SURFACE OF SHEET.
70 DIAMETERS.

smooth thick deposits of copper could be obtained at very high current densities which could not be obtained by any other method. Further investigations were made to determine this speed, and to ascertain the effect of increasing speed, every other condition being constant. The method eventually adopted for determining the critical speed required under varying conditions was a cathode in the form of a cone, as shown in fig. 10, by which means the critical speed can be determined very readily. It has been found that the tensile strength of the copper increases with the speed of rotation.

It is found that very pure copper is obtained by the centrifugal process, even when very high current densities are employed.

Fig. 6 shows the mandrel stationary. On examining the mandrel immediately after starting to revolve the dirt and gas bubbles which were adhering to the mandrel can be seen being dissipated.

Fig. 7 shows the mandrel running under normal conditions at critical speed. By watching the process in operation on a screen it will be observed when any particles of impure metal detach themselves from the anodes and gradually approach the cathode, as soon as they arrive within a certain zone of the cathode they are immediately repelled by the centrifugal action.

Another great advantage of the centrifugal process is that the copper is free from lamination, such as is found when copper is burnished at stated intervals; this point has been established both by mechanical tests and microscopical examination. In the latter case specimens were cut from three samples and were polished, etched, and photographed; in all cases the metal was close and homogeneous, and free from gaps, pits, and fissures.

EFFECT OF VARIATIONS OF SPEED.

It has been found that any stoppage or great variation in the speed of the mandrel causes lamination. This point is clearly shown

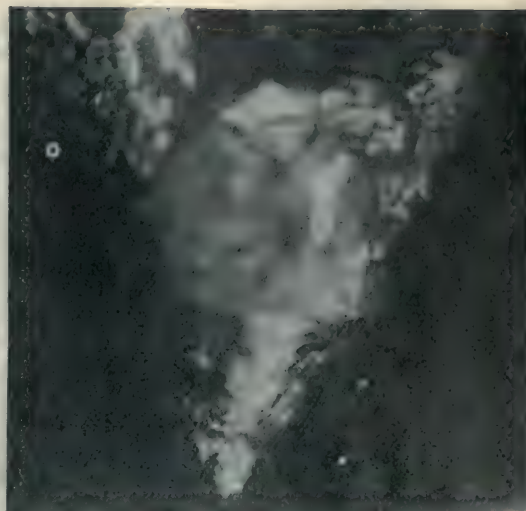


FIG. 9. ROOT OF NODULE DRAWN FROM COPPER SHEET.

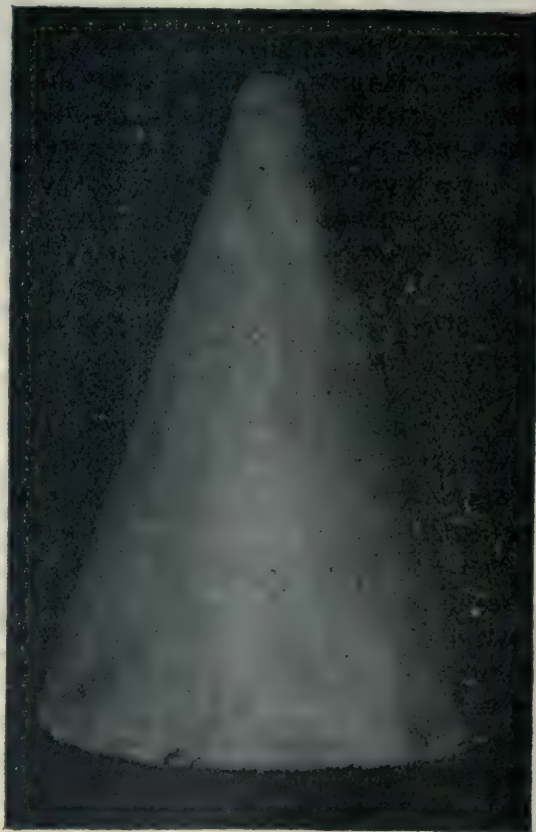


FIG. 10. CATHODE IN FORM OF CONE FOR DETERMINING CRITICAL SPEED.

in microphotograph work. The nodules or excrescences that form on copper are nearly always due to a particle of dirt settling on the cathode or a bubble of gas adhering tenaciously, with the result that the copper builds up around the adhering substance, rapidly increasing in size, as shown in the microphotograph illustrated in fig. 9.

A word may be added as to the apparatus employed for the centrifugal process. The mandrel is provided with Pelton wheels, which are driven by the electrolyte impinging against them. The method of expanding off the tubes is by passing over the surface a rounded roller.

Copper tubes produced by this process without any drawing have been given a maximum stress of seventeen tons, and a tube after drawing has stood a pressure of 3,000 lb. per square inch—thickness of metal 0.063 in.—without showing any signs of distress; and sheets, without rolling, have been given a maximum stress of from 28 to 34 tons (2,000 lb.) per square inch.

The capital expenditure on plant required for the centrifugal process compares very favourably with an up-to-date rolling mill and wire drawing plant; the cost of such a plant with buildings, engines, and the necessary plant is stated to be about £80,000 for an output of about 100 tons per week or 5,000 tons per annum.

These figures represent the actual working cost, on which there would be a further reduction for the precious metals recovered, and if £1 10s. be deducted from the above cost, which is at present the difference between Chilibar and electrolytic copper, the cost per ton is reduced to 18s. 5d.

The following are some of the chief advantages claimed for the process: The copper is refined and manufactured into sheets or tubes in one operation, the copper being of a hard nature, similar to that which is cold-rolled; the process is at least ten times faster than any existing

electrolytic process; a high current can be employed without deteriorating the quality of the copper; there is no risk of lamination, as no burnisher is employed; the plant is simple and free from mechanical complications, the amount of copper locked up for a given output is small compared to other processes; finally, anodes of very impure copper can be used as compared to the anode copper used in other systems.

Extract of paper read before the Faraday Society.

POWER STATION NOTES.

ONE of the principal difficulties which has to be met in turbine design is to fully utilise the velocity of the working medium. Thus saturated steam at 300 lb. absolute expanded adiabatically from a De Laval nozzle has a velocity of over 4,000 ft. per second, and with gas the velocities which will probably have to be dealt with are still higher. Now such velocities as these are far greater than the peripheral speed at which metal can be safely revolved. Amongst ingenious suggestions which have been proposed to meet the difficulty is one in which the nozzles are to be rotated in an opposite direction to the wheels or vanes. It is clear that if two wheels of a given size rotate at the same speed (in opposite directions) this speed will be half of that of a single wheel where the nozzles are stationary, the centrifugal force is therefore only one-fourth of what it otherwise would be.

When pumping warm water it is necessary that the supply should be as high above the pump as possible, otherwise there is a chance of the water vapourising under suction. It is well also to have the suction pipes of very ample diameter, and the rose should be frequently examined to see that it is kept quite free from obstruction. If these precautions are taken there is no reason why the boiler feed should not be quite hot with a resultant economy in working and less wear and tear on the boilers.

The water which is usually drawn away from a piping system through steam traps represents a large amount of heat energy wasted unless means are taken to return the water to the boiler whilst it is still hot. In this respect the Holley gravity system of draining steam pipes is much superior to steam traps.



OUR WEEKLY BIOGRAPHY.

MR. R. W. DANA, M.Inst.C.E., F.R.G.S.

MR. R. W. DANA, secretary of the Institution of Naval Architects, was born in 1868, he being a son of W. P. W. Dana, the distinguished artist. Mr. Dana received his elementary education in Paris, then proceeded to Clifton College, where he studied in the military and engineering section. In 1890 he took mathematical honours at Pembroke College, Cambridge. The following year he was articled to Sir John Wolfe Barry, K.C.B., and Mr. H. M. Brunel, with whom he remained for ten years, obtaining experience in various branches of civil engineering, including the Tower Bridge, Barry Docks, and railway construction. In 1897 he travelled extensively in the United States and visited the principal industrial centres. Mr. Dana was resident engineer for the reconstruction of Kew Bridge, which position he resigned in 1901 in order to take up his present appointment.

96-in. PLANING MACHINE,

BY WILLIAM SELLERS AND CO., INCORPORATED.

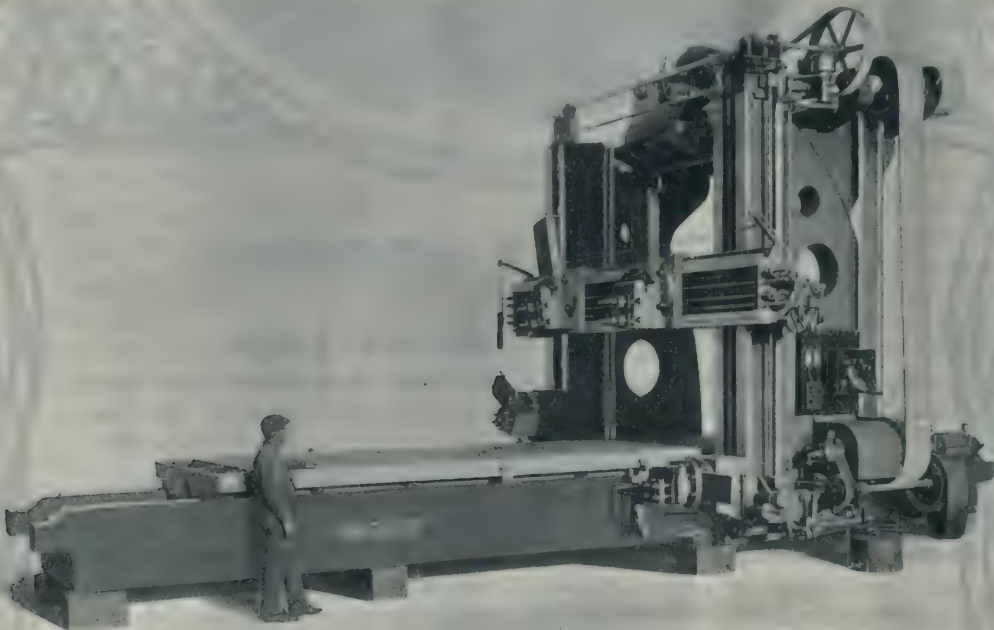
OUR illustration shows the latest 96-in. planing machine, by William Sellers and Co., Incorporated, of Philadelphia. It will negotiate work not exceeding 8 ft. wide by 8 ft. high by 20 ft. long, and has two heads on crossrail and two side heads. The machine has several novel points of construction.

It is operated by a single belt to the pulley shaft, and the movement of the table is controlled by conical friction clutches operated by compressed air. The gearing is arranged to give a constant return speed, with a cutting speed variable by change wheels to suit the work.

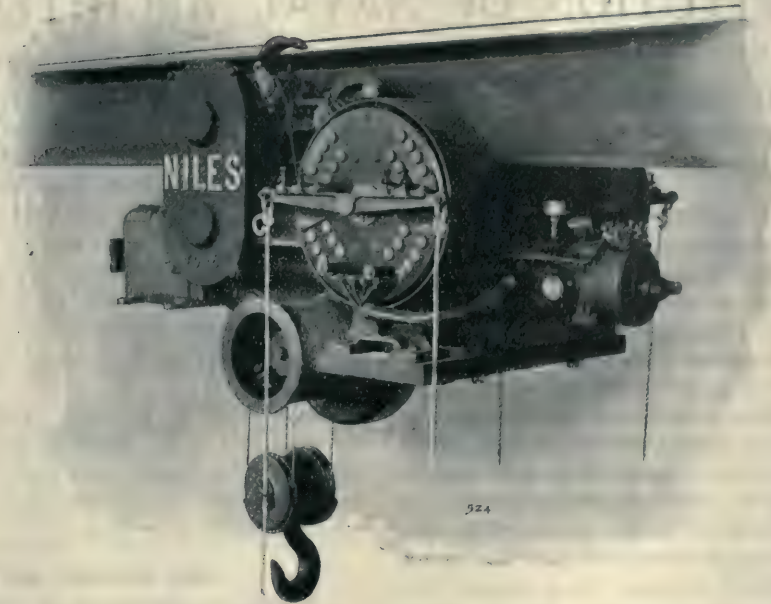
The table, which is driven by spiral pinion

on a diagonal shaft is supported in patent ways with one flat and one V bearing, the latter having a nearly flat bottom, affording ample guide for ordinary work, but provided also with nearly vertical surfaces to take heavy side cuts. The ways are lubricated by an oil pump and circulating system by which the oil is filtered and returned to the tank.

Each tool head has its own feed motion independently adjustable in direction and amount, and each feed has its own stopping and starting device, but all feeds can be thrown out of action or into action by a single lever from either side of the machine.



96-IN. PLANING MACHINE, BY WILLIAM SELLERS AND CO., INCORPORATED.



NILES TRAVELLING HOIST FOR LIGHT LOADS.

The stops on the table operate the air valve and trip the feed escapement. The movement of the table is not employed to operate the feed motion which is separately driven from the top shaft. The table can be stopped, started or reversed by hand from either side of the machine.

The side heads are counter-balanced, have a wide angle of adjustment, and are provided with vertical, horizontal and angular feeds by power. The cross rail is bolted to the inside of the housing as well as to the outside flanges, giving unusual strength to resist the torsional stress of the cut, and bracing the housings firmly against the twist produced by the side heads.

The cross rail has a power-lifting attachment and ball bearing thrust steps are provided on the screws for vertical feeds. The planer is driven by a 40-h.p. motor, mounted on an overhead platform. The return speed of the table is 80 ft. per minute, and the change wheels are arranged for cutting speeds from 20 ft. to 40 ft. per minute.

ELECTRIC TRAVELLING HOIST BY THE NILES-BEMENT-POND COMPANY.

WE illustrate above a form of electric travelling hoist which has been designed by the Niles-Bement-Pond Company to negotiate the quick transmission of light loads in shop, foundry or warehouse. The capacity of these hoists ranges from $\frac{1}{2}$ -ton to 10-tons, the larger sizes being fitted with a cage for the operator, if desired. It is usual, however, to operate the hoist from the floor by means of pendant cords. The trolley travel can be effected either by hand or by electric motors. The hoists are built either to run on a single I-beam or between two channels. All the mechanism is enclosed in oil and dust-proof casings, and is noiseless in operation. A powerful electric brake is attached to the hoist motor, which is additional to the braking effect obtained by the use of the worm and worm-wheel.

INSTITUTION OF NAVAL ARCHITECTS.

EFFECT OF DEPTH OF WATER ON SPEED.

(Continued from page 128)

A PAPER on this subject was read by Mr. Harold Yarrow, of which the following is an abstract:—

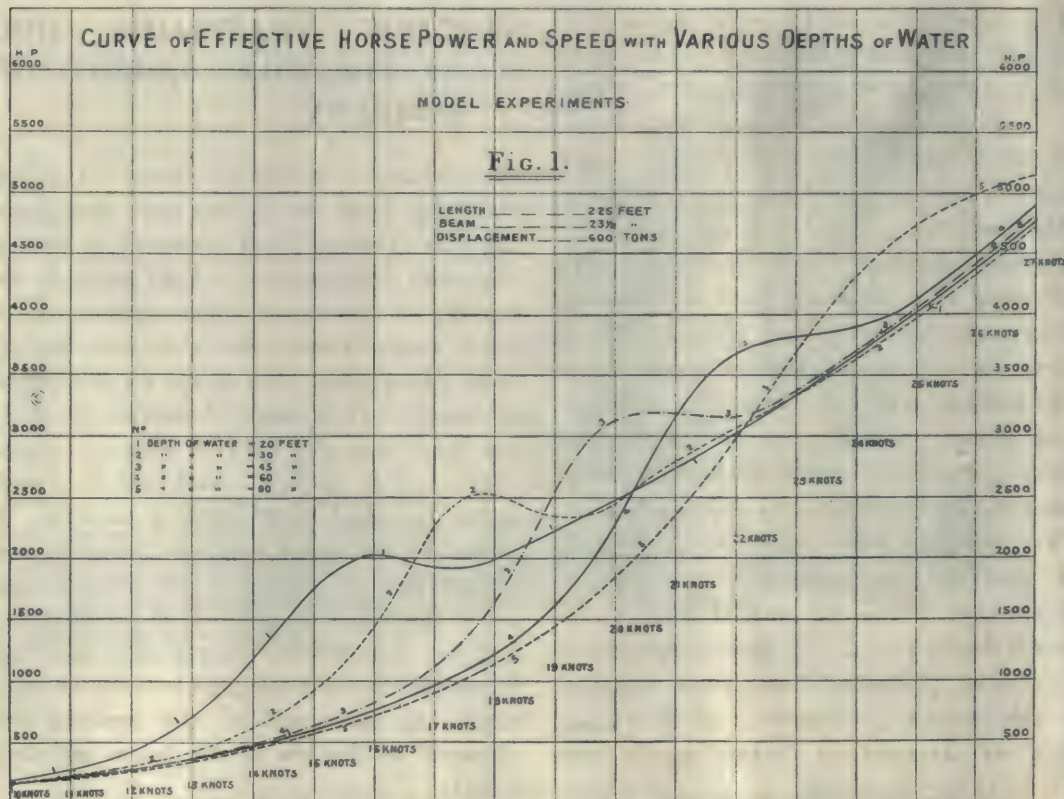
About three years ago the British Admiralty placed orders with several firms for destroyers of a new type, having heavier scantlings than had been previously adopted. These vessels were termed destroyers of the "River Class," being named after various rivers in Great Britain. Their displacement on trial varied from 550 to 600 tons, and the stipulated speed was 25½ knots. Calculation, based on previous trials of destroyers, led to the belief that there would be no difficulty in obtaining this speed with 7,000 h.p. When the trials commenced, however, there seemed little prospect of the speed being realised with the horsepower contemplated. Progressive trials were made over the Maplin measured mile with the destroyer *Usk*,

and when the speed approached that guaranteed a very small advance of speed was obtained for a considerable increase of power. Other contractors experienced similar difficulties, except those who ran their trials on the Skelmorlie mile, where there is a depth of water of about 40 fathoms, this being far in excess of what was available on the Thames or on the East Coast. As all the boats were nearly identical, the conclusion arrived at was that the variation in results was due to the difference of depth of water in which the trials were run.

Having failed to get their speed on the Maplin measured mile at the mouth of the Thames, Messrs. Yarrow and Co. erected mile posts on the cliffs near Dover, off which they successfully ran their first four destroyers of the River class.

THE CRITICAL DEPTH.

It has been found that with a depth of water of 100 ft., or less, the guaranteed speed could not be obtained; but when the depth was 120 ft., or more,



the speed could be realised. These results show clearly the importance of depth. As such a depth of water was not available in the Thames, it was determined to make further investigations, both by tank experiments and by actual trials with destroyers themselves. There being no tank in this country available for such experiments to be carried out for private firms, the North German Lloyd were asked to make them in their tank at Bremerhaven, where they had carried out other experiments for us on previous occasions. They were furnished with the exact lines of the destroyer and were asked to test the resistance of the vessel at a displacement of 600 tons and also at 450 tons, at a depth of 20 ft. and upwards. Fig. 1 shows the results thus obtained of speed and effective horse-power for depths of 20, 30, 45, 60, and 90 ft. for the 600-ton displacement: 90 ft. is the greatest continuous depth available at the mouth of the Thames, and the main object of these experiments was to ascertain whether it would be possible to obtain as good, or nearly as good, a result on the Thames as elsewhere.

RISE OF SPEED IN RELATION TO POWER.

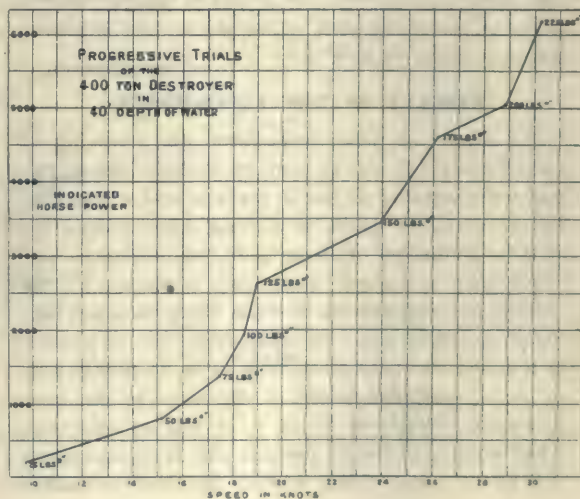
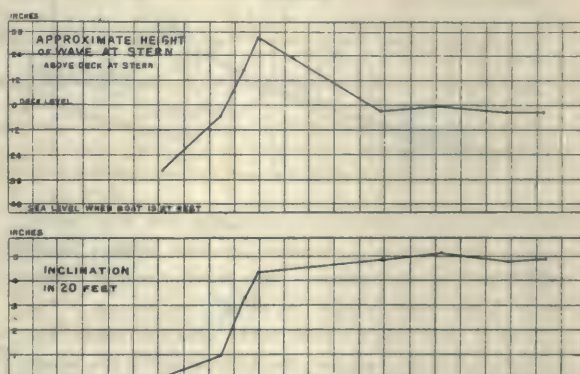
The most noticeable feature in each curve is a distinct hump at which the rise of speed is very small in comparison with the increase of power, and there are other places in the curve where the rise of speed is great in proportion to the increase of power. This was confirmed by a progressive trial made with a destroyer of 400 tons, in a depth of 40 ft., and fig. 2 shows that when the steam pressure was increased from 100 lb. to 125 lb. there was only half a knot rise of speed; but when the pressure was increased from 125 lb. to 150 lb. a rise of 5 knots was obtained. This diagram also shows the inclination of the vessel and the approximate height of the stern wave with reference to the stern of the boat, and it is noticeable that the marked increase of the inclination and stern wave occurs at the points where the power increases rapidly with but a very small rise of speed. Fig. 3 gives this progressive trial plotted alongside corresponding curves found by model experiments. In these curves the effective h.p. is taken as 62 per cent. of the i.h.p., which percentage is not constant for all speeds, but with suitable propellers should be highest at full power. It will be seen, however, that the humps correspond very closely. From fig. 1 it will be noted that the hump occurs at later periods, and is less pronounced when both the depth of water and the speed increase.

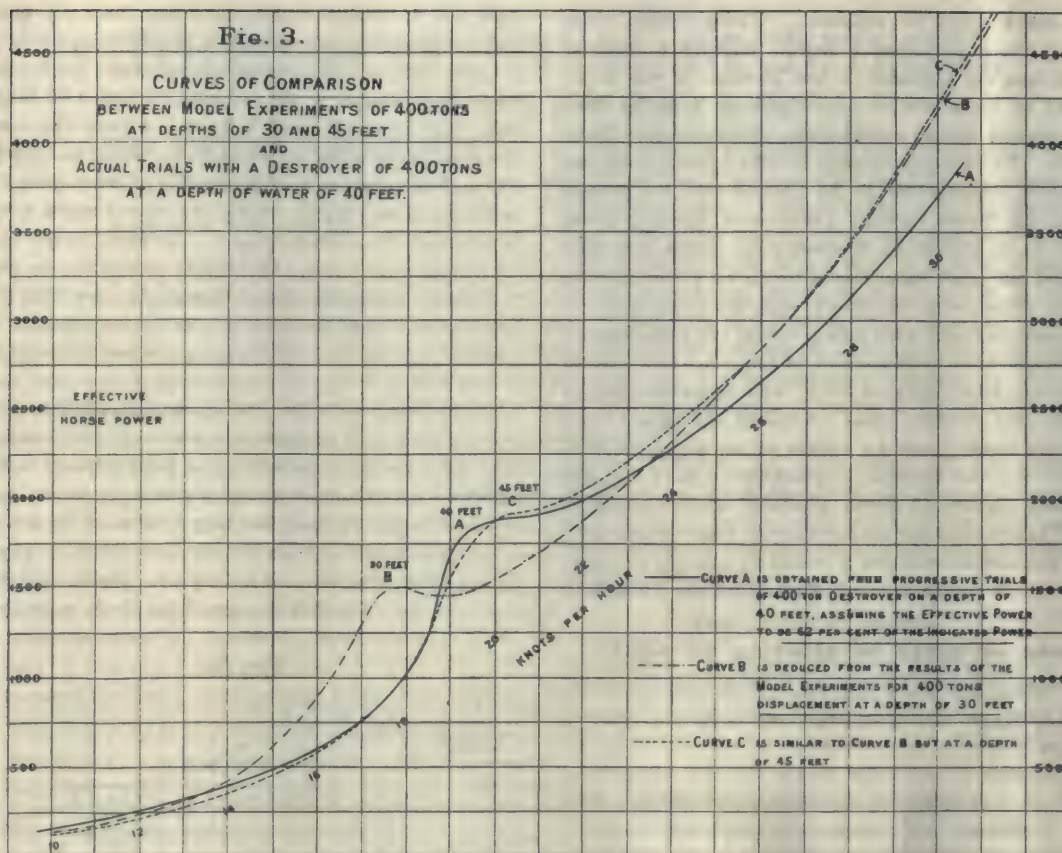
There is no doubt that the difficulty at first experienced with the trials of the River type of destroyers was due to the depths of water where the trials were made being such that the hump came at a critical point for the speed required, and that when the boats

were run in deeper water the hump had not made itself appreciably felt, though it would have done so at higher speeds. These model experiments show some interesting features in the resistance. Based on these, when the depth of water is 45 ft., it takes the same power for a speed of 22 knots as for 20 knots. Now, although the engines may be capable of developing the necessary power for 22 knots, that speed might never be attained when running 45 ft.; because, to get over the hump at 20 knots, the engines would not be able to indicate sufficient power, having in view that the revolutions would be less at the slower speed. If, however, the 22 knots were once reached it could be maintained.

At the same time that the model experiments were being conducted, progressive trials with a destroyer were made on a course which had been selected at the mouth of the Thames. It was about seven miles long, and had depths of water varying from 20 ft. to 100 ft. Runs were made with 40 lb. pressure at the engines, 60 lb., 80 lb., 100 lb., 120 lb., 140 lb., 160 lb., 180 lb., and 200 lb. These pressures were very accurately

Fig. 2.





regulated by an attendant controlling the stop valves on the steam pipe, a surplus pressure always being maintained in the boilers. The exact position where these trials were made is shown in fig. 4. The following observations were taken every minute: The revolutions of the engines; the inclination of the vessel read from a 20 ft. level; the height of the stern-wave, above or below the deck at the stern; and indicator diagrams twice on each run.

RESULTS OF THE EXPERIMENTS.

The results of these experiments are deserving of careful study. It will be seen, for example (see fig. 5), that when working at 100 lb. pressure and at approximately 19 knots speed, in passing from a depth of 55 ft. to a shallow of about 24 ft., the resistance was enormously increased, which fact is shown by the revolutions (the pressure of steam being constant) falling from 278 to 250. Simultaneously, the inclination of the boat was augmented from $2\frac{1}{2}$ in. to nearly 5 in. in 20 ft., and the height of the wave at the stern increased. Referring to fig. 6, it will be seen that, when working at 180 lb. pressure and at approximately $27\frac{1}{2}$ knots speed, there was no increased resistance

when running in a depth from 50 to 19 ft., but the increased resistance occurred at a depth of about 80 ft.

From the foregoing experiments it follows that, in selecting a course for a trial, the main point is not necessarily to get deep water, if unfortunately deep water is not obtainable, but to aim at a depth in which the position of the hump is well clear at the required speed. It should be noted that the inclination of the vessel taken in conjunction with the revolution gives a very fair estimate of the depth of water for depths varying from 20 ft. to 100 ft., and this might possibly be turned to useful account for navigating purposes. For example, if the destroyer be running at about 19 knots (fig. 5) and the officer in charge does not desire to go nearer the shore than 24 ft. depth, immediately the inclination rises to $4\frac{1}{2}$ in. in 20 ft. he knows that his limit is being approached. To carry out this method of arriving at the depth successfully, proper data of the characteristics of each vessel must necessarily in the first place be obtained. Assuming that is done for vessels such as torpedo-boats or destroyers, the depth of water under the boat can at any time be approximately arrived at.

From the foregoing experiments the importance of a

reliable measured mile will be clearly seen, and, as there is a depth of 180 ft. within a short distance of the Goodwin Sands, it would be of considerable value if a measured mile were fixed at this spot, as it would enable the Admiralty to obtain reliable results for vessels from Chatham, Sheerness, and Portsmouth, and also for vessels constructed on the Thames.

DEDUCTIONS FROM EXPERIMENTS ON INFLUENCE OF DEPTH OF WATER ON SPEED.

Mr. W. W. Marriner contributed a paper on this subject, of which the following is an abstract:—

It has long been known that depth of water greatly influences the speed of vessels, and that there were some depths at which the resistance was abnormally great. It was the aim of experiments therefore to find

out what would be the worst depth for a vessel, so that in trial trips one could keep clear of the point of maximum resistance.

In the modern theory the total resistance is considered to be made up of three principal parts: frictional resistance, due to the gliding of particles over the rough bottom of the ship; eddy-making resistance; surface disturbance, or wave-making resistance.

The present investigation had reference to the last of these. The height of the wave at the stern increases when the resistance of the ship increases abnormally. This is a most important point, and it is not unreasonable to assume that anything which tends to retard the formation of waves reduces the loss from wave-making.

First dealing with the transverse waves. The transverse waves obviously move at the same speed as the ship, and in deep water the bow and stern waves will repeat themselves in lengths given by the formula for



FIG. 4. SHOWING COURSE WHERE TRIALS WERE MADE.

deep water. When the vessel gets into shallower water the length of the waves should obey the law for shallow water; in other words, they should tend to become longer and longer for the same speed as the depth diminishes until we reach the critical depth, when we should have the "isolated" type. If the vessel advances into still shallower water, we should get past the critical depth, and arrive at the condition when there is no transverse wave that corresponds to the speed of advance.

As to the waves getting longer, when the vessel runs from deep into gradually shoaling water, they do not seem to lengthen as rapidly as the curves indicate; but if they do not lengthen as rapidly as the above investigation would lead one to suppose, then they are travelling faster than their natural speed for the length, and they must be, as it were, dragged along by the boat. The increased resistance on approaching the humps, shown by the curves in Mr. Yarrow's paper, points to a possibility of something of this kind.

ISOLATED WAVE CHARACTERISTICS.

Next, the "isolated" wave has distinct characteristics: It is non-repeating, and it exists only under certain relations of depth and speed. In all the experiments it was noted that at the critical combination of depth and speed the wave at the stern, although very big, did not repeat itself to any appreciable extent, while ordinary deep water stern waves could be seen repeating themselves over and over again.

It was also found that the maximum wave and the corresponding point of maximum resistance occurred very near the critical combination of speed and depth.

The curve of effective horse-power on this page has been prepared with all the different points of maximum resistance, obtained by various experiments, dotted on.

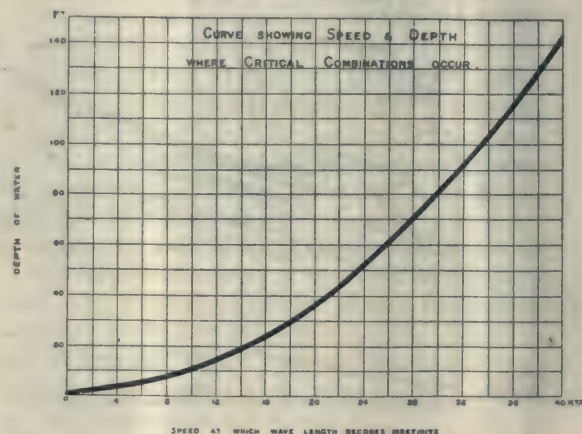
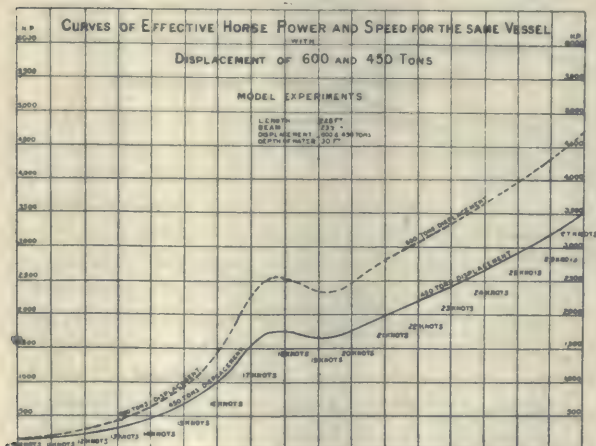
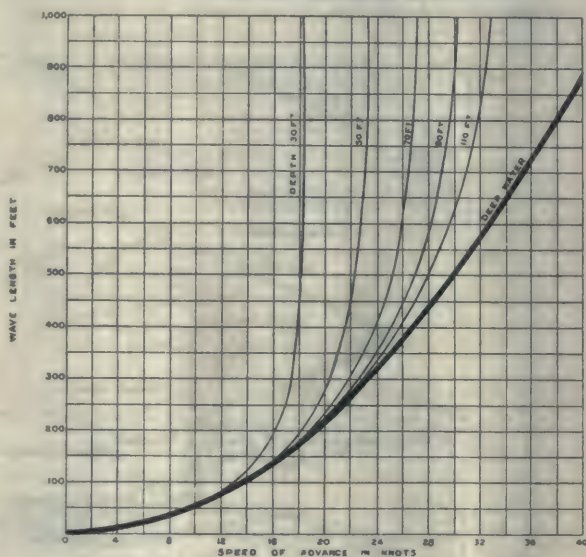
After passing the critical place, there should be no appreciable transverse wave; and it is found that the wave does actually disappear, being replaced by confused water.

The curve showing speed and depth indicates that for a vessel at two displacements, 600 and 450 tons, respectively, the critical speed, as represented by the humps, is to be found at the same depth.

There are not only critical speeds and depths, at which the resistance greatly increases, but for each ship there is a worst critical speed and depth (see diagram page 144).

With reference to the diverging waves formed by a ship, which form an important feature in wave-making resistance, their velocity is much less than the speed

CALCULATED CURVES OF
SPEED OF ADVANCE & LENGTH OF WAVES
IN DIFFERENT DEPTHS OF WATER



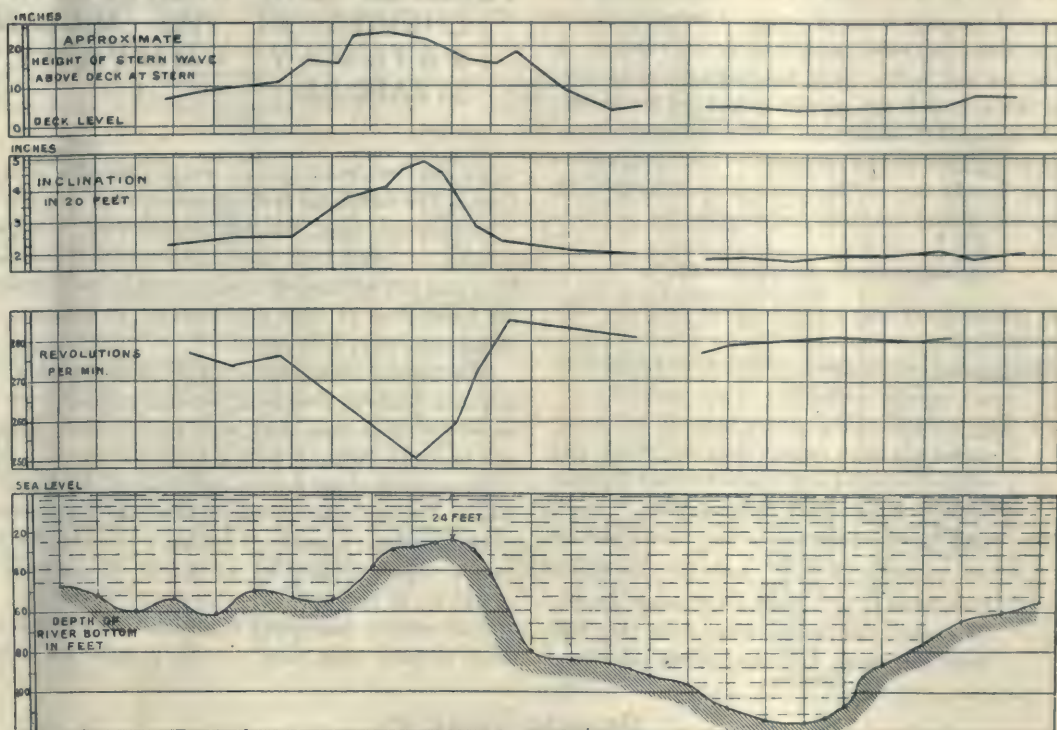


FIG. 5. MEAN SPEED THROUGH WATER OF ABOUT 18.9 KNOTS AND STEAM PRESSURE 100 LB.

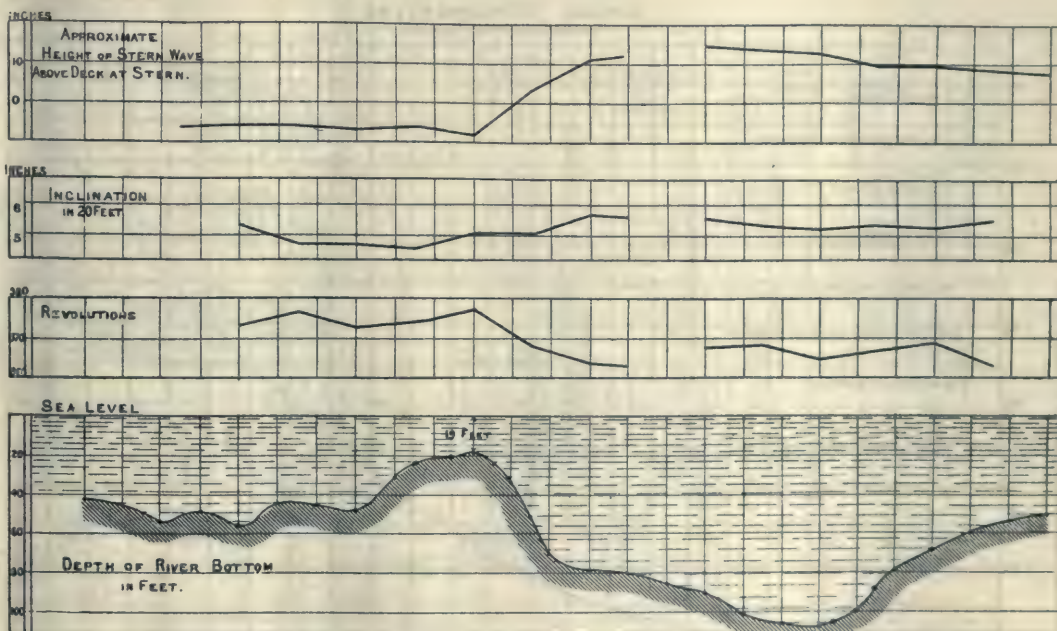


FIG. 6. MEAN SPEED THROUGH WATER OF ABOUT 27.2 KNOTS AND STEAM PRESSURE 180 LB.

of the ship, as it is equal to the component of the velocity of the ship in the direction of the propagation of the diverging wave, and the speeds attained at present are not high enough for these waves to anything like approach the critical speeds for the depths in which vessels usually run. The diverging waves apparently constitute the principal wave-making resistance at speeds beyond the critical combinations of depths and speeds which we are considering.

CONCLUSIONS SUMMARISED.

The present knowledge seems to point to the following deductions:—

The critical combinations of depth and speed do not depend on the size of the vessel.

Of these critical combinations there is for every vessel one more serious than the others, and where this worst combination occurs depends largely on the length of the vessel.

The depth to be avoided is about that given by the equation $d = \frac{V^2}{10}$, and the resistance diminishes in both greater and lesser depths. Of course, the further away from this bad depth the better, especially on the deep side.

TURBINES AND RECIPROCATING ENGINES IN THE MIDLAND RAILWAY COMPANY'S STEAMERS.

A paper was read on this subject by Mr. William Gray. The following is an abstract:—

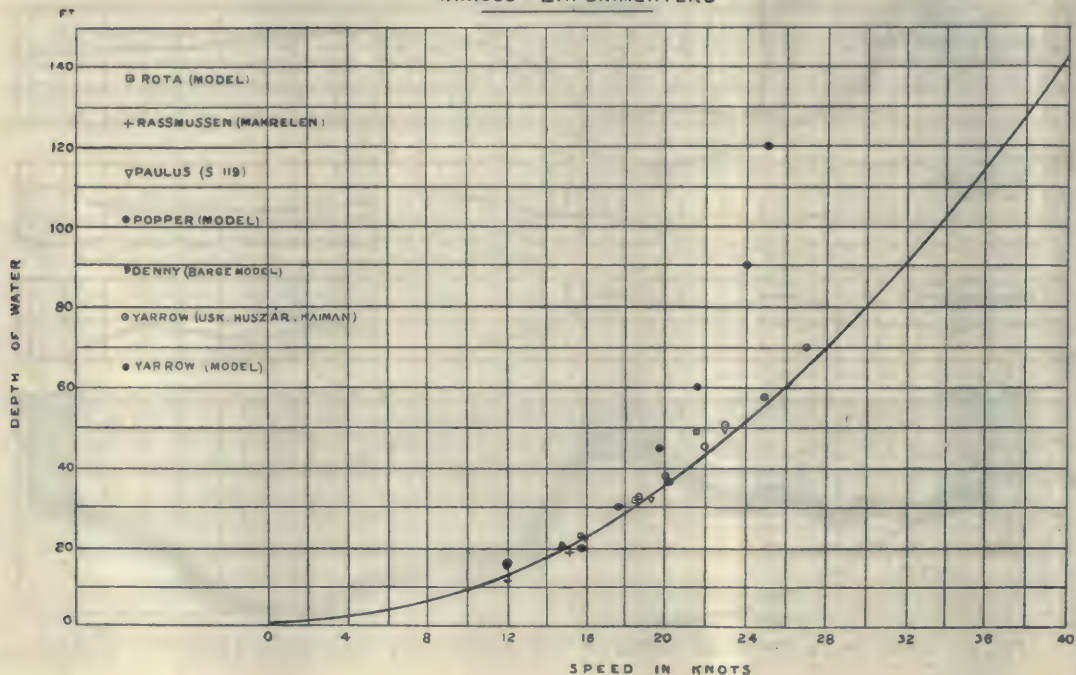
In January, 1903, the Midland Railway Company decided to build four new screw steamers for their Irish and Isle of Man services, in view of the approaching completion of their new harbour at Heysham, in Morecambe Bay, Lancashire.

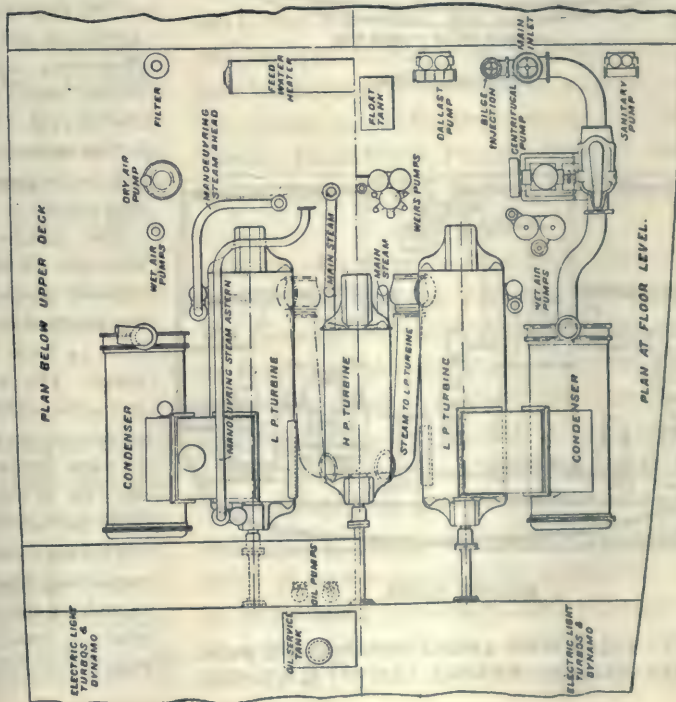
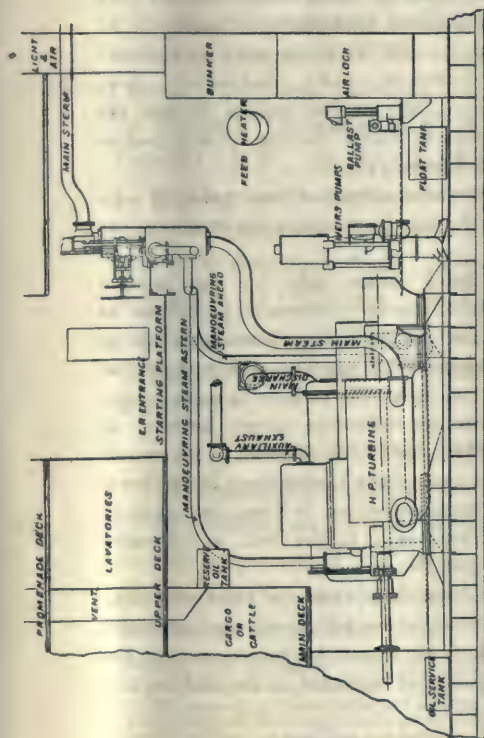
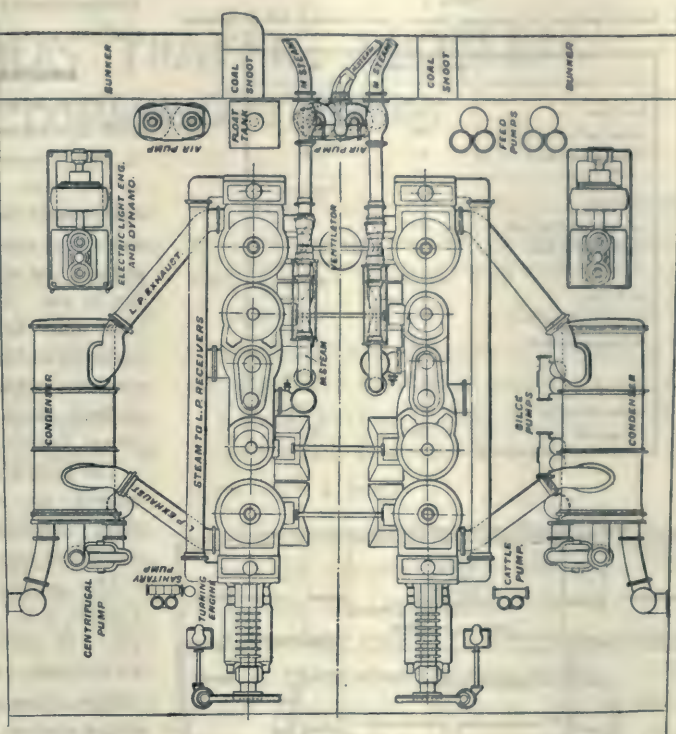
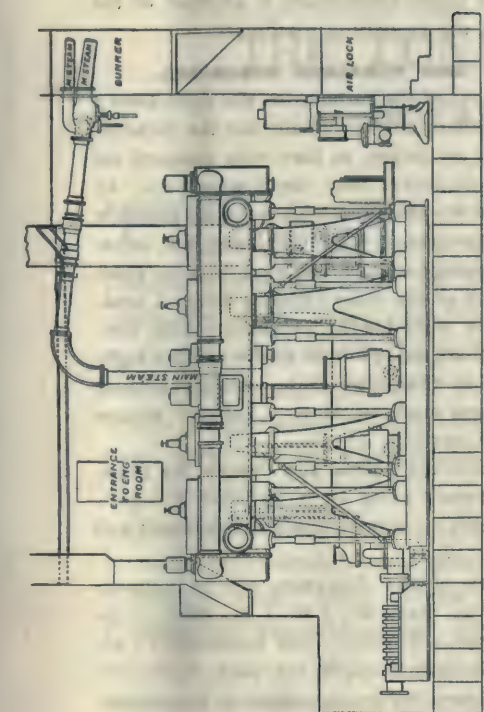
After careful consideration of the data available, the Midland Railway Company decided to fit two of the vessels of their new fleet with reciprocating engines and two with Parsons' marine turbines.

The engines of the *Antrim* and *Donegal* differ only in detail. They consist of two sets of the four-cylinder triple-expansion type, each driving a three-bladed propeller. The cylinders are 23 in., 36 in., and two of 42 in., by 30 in. stroke.

The auxiliary machinery in all the steamers is of the most modern type, and as the pumps are driven

DEDUCED CURVE OF
WORST COMBINATION OF DEPTHS AND SPEEDS
SHOWING RESULTS FROM
VARIOUS EXPERIMENTERS





TURBINE ROOM.
FIG. 2. TURBINE AND ENGINE-ROOMS ON THE MIDLAND RAILWAY COMPANY'S STEAMERS.

TABLE B
SHOWING RESULTS OBTAINED BY STEAMERS RUNNING SIMULTANEOUSLY, BUT IN OPPOSITE DIRECTIONS.

	Reciprocating Engines	Turbines
No. of trips	Antrim 45	Londonderry 48
Average coal per trip (tons)	35.6	35.3
Average speed in knots	19.7	19.5
No. of trips	Donegal 42	Londonderry 48
Average coal per trip (tons)	36.0	36.0
Average speed in knots	19.2	19.8
No. of trips	Antrim 29	Manxman 29
Average coal per trip (tons)	38.6	38.6
Average speed in knots	19.5	20.3
No. of trips	Donegal 30	Manxman 30
Average coal per trip (tons)	38.7	40.2
Average speed in knots	19.3	20.3

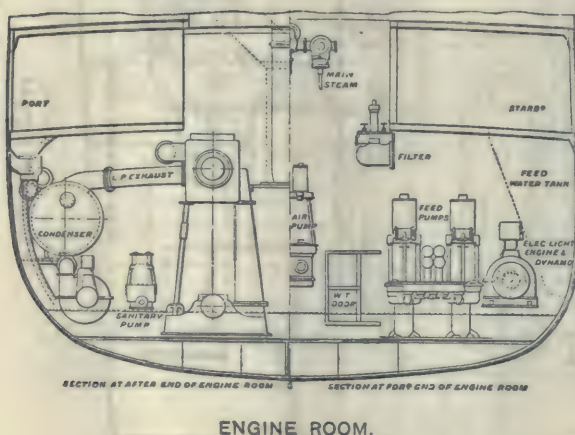
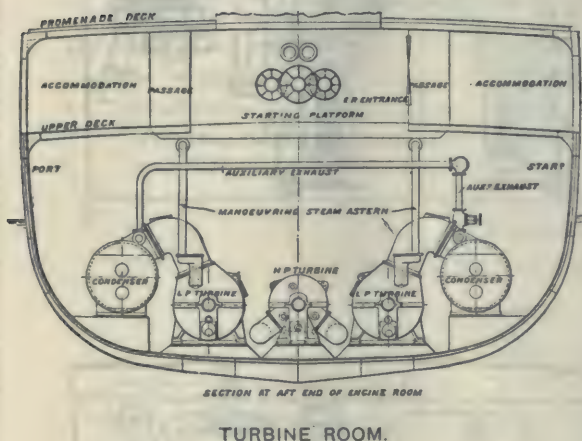


FIG. 1. SECTION OF ENGINE AND TURBINE ROOMS ON THE MIDLAND RAILWAY COMPANY'S STEAMERS.

independently a better comparison is afforded of the performances of the propelling machinery.

ENGINES AND TURBINES DESCRIBED.

The arrangement of the turbines in the *Londonderry* and *Manxman* differs only in detail, but the turbines in the *Manxman* are larger, as they were designed for 25 per cent. more power than the *Londonderry*. In each vessel there are three turbines, one high pressure and two low pressure. With the latter are incorporated the reversing turbines that work *in vacuo* when not in use. Each of the three turbines drives a separate shaft and a three-bladed propeller. The low-pressure turbines are on the outer shafts and the high-pressure turbine on the centre shaft. All the turbines in both ships were made by Messrs. Parsons' Marine Steam Turbine Company.

The propellers of the *Antrim* and *Donegal* are three-bladed, the *Antrim's* being built and the *Donegal's* solid. The *Antrim's* is a little smaller in diameter and coarser in pitch.

The propellers of the *Manxman* are as follows: Centre, 6 ft. 2 in. diameter, 5 ft. 7 in. pitch; side, 5 ft. 7 in. diameter, 5 ft. pitch. The *Londonderry's* are all the same, 5 ft. diameter, 4 ft. 6 in. pitch.

Figs. 1 and 2 show the arrangements of the reciprocating engines and the turbines.

The conditions of the contract were that each vessel was to maintain a speed of 20 knots per hour for six continuous hours with the double-ended boilers only under steam and 300 tons deadweight on board.

The results of the official trials were as follows: Speed in knots: *Antrim*, 20.6; *Londonderry*, 21.6; *Manxman*, 22.65. With all the boilers in use the results were: Speed in knots: *Antrim*, 21.86; *Londonderry*, 22.36; *Manxman*, 23.12.

The amount of water consumed was measured during the progressive trials by counting the strokes of the feed pumps.

The figures throw some light on the relative economy not only of the two systems of propulsion at various speeds, but on the different arrangements in the two turbine steamers themselves. They show that from 14 knots to 20 knots the turbine is more economical. The maximum difference occurs between 19 and 20 knots, which is the working speed of the vessels on service. In the case of the *Londonderry* the decrease in water consumption amounted to 8 per cent., and in the case of the *Manxman* to 14 per cent., as compared with the *Antrim* and *Donegal*.

The logs have been very carefully examined, and, neglecting those runs where full speed was not maintained for the whole time that the vessels were in the open sea, some results are recorded in the table on this page.

(To be continued.)

THE LONDON TRAFFIC PROBLEM.

ROYAL COMMISSION'S REPORT.

THE first volume of the much anticipated report by the Royal Commission on London Traffic was issued on Monday evening, consisting of 123 pages and three maps. This represents only a part of the work accomplished, but it is the most important of the eight volumes which will probably be issued before Parliament rises, as it includes the general conclusions of the Commission.

The Royal Commission on London Traffic, it will be remembered, was appointed on February 10th, 1903. From His Majesty's Commission the antiquated diction of which seems in strange contrast with the progressive nature of the subject in hand, we learn the names and titles of the "right trusty and right well-beloved" and also the merely "trusty and well-beloved gentlemen" who compose the Commission. It originally consisted of Sir David Miller Balfour, K.V.S.I. (chairman); Earl Cawdor, Viscount Cobham, Lord Ribblesdale, Sir Joseph C. Dimsdale, M.P., Sir John Dickson-Poynder, M.P., Sir Robert Reid, Sir Francis J. S. Hopwood, permanent secretary to the Board of Trade, Sir George C. T. Bartley, M.P., Mr. C. S. Murdoch, C.B., of the Home Office, Mr. Felix O. Schuster, Sir George S. Gibb, general manager of the North-Eastern Railway Company, and Mr. Lynden L. Macassey, secretary.*

SCOPE OF THE INQUIRY.

The Commission were requested to report (a) As to the measures which were deemed most effectual for the improvement of locomotion and transport in London by the development and inter-connexion of railways and tramways on, or below, the surface; by increasing the facilities

for other forms of mechanical locomotion; by better provision for the organisation and regulation of vehicular and pedestrian traffic, or otherwise; (b) As to the desirability of establishing some authority or tribunal to which all schemes of railway or tramway construction of a local character should be referred, and the powers which it should be advisable to confer upon such a body.

PROCEDURE FOLLOWED.

For the purpose of carrying out these instructions the Commission held 112 meetings and examined orally 134 witnesses. The chairman and four other members of the Commission (Lord Ribblesdale, Sir John Dickson-Poynder, Bart., D.S.O., M.P., Sir George C. T. Bartley, K.C.B., M.P., and Sir George S. Gibb), together with Mr. Lynden Macassey, the secretary, visited the United States of America in September, 1903, and examined the means of locomotion and transport in New York, Boston, Philadelphia and Washington; while in the autumn of 1904 Sir George C. T. Bartley visited the cities of Vienna, Buda-Pesth, Prague, Cologne, Dresden, Berlin, Brussels and Paris.

NO FINALITY.

Those who expected some immediate panacea for the relief of London traffic will be disappointed. The Commission state at once that there is no finality in the question of the best means of locomotion and transport for great cities; and, in the case of London, it is necessary, in a very special degree, that the problem should be considered, in the first instance, on broad and general lines, and that, subsequently, a series of separate and distinct inquiries should be undertaken in order to deal with particular branches of the subject. Continuous attention is required in order to ensure that the practical

* Sir George C. T. Bartley does not sign the report, while Sir Joseph C. Dimsdale and Sir George Gibb do so, subject to stated objections. These objections are dealt with on page 115.

measures, which these inquiries may show to be expedient, shall be brought into harmony with each other and with a general plan, as well as to provide the means of meeting new wants, and to take advantage of fresh scientific discoveries affecting the provision of the means of locomotion and transport.

For these and other reasons the Commission advise the appointment of a permanent body to deal with questions of London locomotion. The constitution of the new authority, and the powers which it should possess, could not, however, be satisfactorily determined without a full examination of the nature of the problem, and some inquiry into the merits of the suggestions received. In this view of the question, the Commission have not merely taken evidence of a general character, but have, by a special arrangement, obtained expert and technical advice on certain matters of primary importance. One of the members of the Commission, Sir John Wolfe Wolfe-Barry, K.C.B., past-president of the Institution of Civil Engineers, undertook to act on and preside over the advisory board of engineers the Commission consulted. They were fortunate to obtain the services of Sir Benjamin Baker, K.C.B., K.C.M.G., past-president of the Institution of Civil Engineers, and Mr. William Barclay Parsons, M.Inst.C.E., chief engineer to the Board of Rapid Transit Railroad Commissioners of the City of New York.

No attempt has been made to pass judgment upon the projects of particular promoters that have been or are before Parliament, or to discuss their relative merits. The statistics and information which have been collected, and the evidence which has been taken, have necessarily occupied a long time, but the Commission are undoubtedly right in their view that the time thus spent has not been wasted, and that the data obtained will facilitate the labours of those who take up the problem where the investigation of the Commission comes to an end. A summary of Vol. I. is appended.

MAGNITUDE AND IMPORTANCE OF THE PROBLEM.

One of the most important features of the problem of London locomotion is the movement of the population from the suburbs towards the centre every morning and back again in the afternoon and evening. The area dealt with in the report is that of the City of London and the Metropolitan Police District, comprising 69.84 square miles. It will, however, be desirable that some means should be provided for extending or modifying from time to time, and as circumstances may require, the area subject to special treatment.

The population of "Greater London" in 1901 amounted to 6,581,402 persons, but this figure inadequately represents the number of persons for whom special facilities for locomotion will be required in the future.

It is impossible to foretell the extent to which the population will increase even in the next thirty years, but it is growing rapidly, and provision must be made for meeting the requirements of a much greater population than that which existed in 1901.

The necessity for additional means of locomotion increases in a higher ratio than that of the growth of the population. This result is largely due to the gradual abandonment, for various reasons, of the crowded centres as places of residence, which necessarily involves an increase of the daily movement of the population. The decrease in the night population of the City of London began half a century ago, and, as in illustration of the extent to which is has proceeded, it is mentioned that, although the night population of the City of London was 112,063 in 1861, it was 26,923 in 1901, while the number of people who spend the day there in work or business amounts to 359,940, and no less than 1,250,000 persons and 100,000 vehicles enter and leave the City of London daily.

The figures just given, taken in connection with the present conditions of congestion of traffic in so many of the streets of London; the difficulties which persons residing in the suburbs experience in moving to and from their daily work; the overcrowding of houses in the central area; and the impossibility of housing the working classes in that area at rents which they can afford to pay, are conclusive as to the necessity of dealing with the whole problem of London locomotion on a comprehensive plan, and with as little delay as possible.

The nature of the vehicular traffic varies at different points, but Sir Alexander Bruce, Assistant Commissioner of Metropolitan Police, estimates that 60 per cent. of the vehicular traffic of London is made up of omnibuses and hackney carriages. Apart from the special delay at points of intersection, there is no doubt

that the continuous growth of vehicular traffic is causing, and, unless some remedy is applied, will continue to cause, increasing congestion in the streets, with resulting slowness of movement. The burden of delay falls on all passengers, but presses most heavily on the professional and working classes.

THE "HOUSING" PROBLEM.

The evils resulting from slow and imperfect means of locomotion appear to the Commission to be quite as serious from a social as from an economic point of view. As an illustration of this branch of the subject, they deal at some length with the question of cheap and rapid communication as it affects the housing of the working classes. The evidence has clearly established that the price of land in the central districts of London makes it impossible to re-house the working classes within those districts at rents which they can afford to pay without a heavy loss to those who undertake the re-housing. Also that the price of land a few miles out is still sufficiently low to admit of re-housing, without loss, at rents which the tenants can afford to pay. An illustration of the loss incurred by re-housing the working classes in the central portions of London is furnished by some recent experiences of the London County Council. In connection with the Holborn to the Strand Improvement the workmen's dwellings erected will accommodate 2,640 persons, and there is a loss of very nearly £60 per head of the persons re-housed, the whole of which falls upon the rates. The Tooting dwellings, on the other hand, accessible by electric tramway and by railway, are self-supporting.

The lesson to be learned from these two cases is confirmed by every housing scheme, without exception, that the London County Council have undertaken; wherever they have had to provide workmen's dwellings in the central districts, there has been a heavy loss. In effect the rents are largely paid out of the rates. In the few cases where they have provided workmen's dwellings outside, the schemes have been self-supporting so far as houses have been built.

In short, the evidence proves that it is not practicable to re-house the working classes in the central districts at economic rents, while, in the outer zones, re-housing can be effected without loss if means are provided to enable workmen to get in and out of London quickly and cheaply.

If there were facilities for going out in all directions, not only would the great overcrowding in trains, which has been the subject of much complaint, be lessened, but the demand for housing would be more dispersed, and the rents payable by the working classes would be kept within moderate limits. Where only a few districts are opened up, and a great many are

really required to satisfy the necessities of the population, a higher rental is created in those few which alone are made accessible.

Whatever view may be taken in regard to the acquisition and disposal of land by railway companies, or by the London County Council, the Commission have come to the conclusion that, in order to relieve overcrowding, means must be provided for taking the population into and out of London, not in one or two directions, but in many directions, at rapid speed, frequent intervals, and cheap rates.

It cannot be right to promote, by an indirect subsidy, the retention of factories and businesses in the overcrowded parts of the Metropolis, where, without such assistance, they can no longer be carried on at a profit. The provision of houses, at less than cost price, in crowded localities, must tend to check the movement, which has already begun, for the removal of certain classes of work to the outskirts of London, or even beyond them.

THE PRINCIPAL DIFFICULTY.

The chief difficulty that stands in the way of improving the means of locomotion in London is the narrowness of the streets, and the fact that they were not originally laid out on any general plan. The report states succinctly what has been done in the past, giving a history of London street improvements, railway constructions, and street tramways.

CONSIDERATIONS OF COST.

If considerations of money could be disregarded, it would be easy to apply the remedy at once, by taking in hand a vast scheme for remodelling the congested parts of the Metropolis—wide thoroughfares to connect all parts of London—tramways on a very large scale on widened thoroughfares—railways underground, radiating in all directions into the country, and there meeting lines which should distribute passengers throughout the adjoining areas. These measures supplemented by strict regulations in regard to all future buildings would solve the problem, and there is no physical obstacle that could not be easily overcome by engineering skill: the difficulty is simply one of money.

It will be convenient to consider the measures for improving locomotion and transport in London under four separate headings: "Street Improvements"; "Tramways"; "Railways"; and "Traffic Regulations and Other Matters."

STREET IMPROVEMENTS—SUGGESTIONS FOR, RECEIVED BY THE COMMISSION.

In the course of evidence a great number of suggestions have been put forward by witnesses with a view to improving the streets and relieving congestion:

making roads in different directions out of London; constructing a circular road about seventy-five miles in length, at a radius of twelve miles from St. Paul's; providing alternative streets parallel to crowded thoroughfares, and new streets; removing factories from London; together with a multitude of particular works in the way of widening, have been suggested. They involve enormous expenditure, but the Commission do not enter upon them, because the Advisory Board of Engineers have furnished a report, which was compiled after full consideration of all these proposals, and embraces all the proposals that require particular notice.

The projects put forward by the Advisory Board of Engineers are based upon the view that those entrusted with the duty of providing for the wants of London in years to come ought to have before them a carefully thought out plan, and definite principles upon which they should work. They instance the case of Paris, important sections of which city were gradually remodelled and new parts laid out, between the years 1793 and 1889, in general accordance with schemes elaborated in 1793 and again in 1854.

PROVISION FOR WIDER STREETS.

Acting upon this view, the Advisory Board have embodied in their report the following conclusions, among others: (1.) That new streets or widened streets should be laid out according to the following standard of widths from house to house, depending upon their importance, and the degree to which they are likely to attract traffic: "Main Avenues," 140 ft.; "First-class Arterial Streets," 100 ft.; "Second-class Streets," 80 ft.; "Third-class Streets," 60 ft.; "Fourth-class Streets," 40 or 50 ft. The width in each case includes footways on either side, and no street should be less than 40 ft. wide. This standard of width is intended to be applied within London, and also in the suburbs. (2.) That street improvements should be undertaken in conformity with a carefully-considered plan, designed to meet the requirements of through-traffic, which may be carried out over a long series of years. The Advisory Board of Engineers do not themselves lay down any such comprehensive plan; it must be undertaken by those responsible for the work, and must, of necessity, involve prolonged and minute consideration; but they have, by way of illustration, indicated a number of improvements which they think necessary, and have explained in their report the grounds of their opinion. The list does not purport to be exhaustive, but includes the bulk of the works which they regard as important.

PROPOSED MAIN AVENUES.

By far the most important of their recommendations is a proposal for the construction of two Main

Avenues through London, one from west to east to connect Bayswater Road with Whitechapel, and passing through the City of London in the neighbourhood of London Wall, the other from north to south to connect Holloway with the Elephant and Castle, passing by a new bridge across the Thames near the western boundary of the City (see page 114). The precise route which these avenues should follow is not definitely fixed, and would have to be laid out when the time for construction comes. Each avenue would be 140 ft. in width, from house to house, with subways for water mains and so forth, and would afford space for cellars under the footpaths. It is also intended that there should be four lines of tramway on the surface, and four lines of railway a few feet below the surface, so as to allow express trains and local stopping trains to be run on different rails. Both tramways and railways are intended to be worked by electricity.

The design is that the tramways on each of these Main Avenues should be connected with the tramway systems at both ends, and also afford interchange of traffic with the various systems of tramways crossed on the route, so as to provide through communication with all parts of London and its suburbs. In the same way, the four lines of electrical railway in the sub-structure would be connected with the various systems of the railway companies. Arrangements could be made for through running, and thus railway, as well as tramway, communication throughout London would be facilitated.

The Advisory Board of Engineers attach more importance to the west and east Main Avenue than to the one running north and south, partly, because the volume of traffic to the east and west is greater, and, partly, because the north to south avenue would not afford accommodation for traffic to and from the docks, as the former avenue would at night.

The Commission entertain no doubt that both the Main Avenues above suggested would be of great value in relieving the congestion in the streets of London, and in providing much-needed facilities for locomotion, not only on the surface, but by bringing a complete system of railway and tramway lines through the City and central area of London. At the same time, it is necessary to dwell upon the very heavy outlay that would be involved in these schemes; they are moreover schemes, each of which is complete in itself, and cannot be carried out piecemeal, involving, as each does, much sub-structure. Each of them must therefore be considered as a work which, once taken in hand, will have to be carried out without interruption. In considering the cost it is impossible to arrive at any very trustworthy figures, in the absence of careful alignment and detailed surveys and estimates. It is gathered from the report that the east and west

avenue, with its subways, railways, and tramways, would involve a net cost of about £15,550,000, upon the rough calculations that are alone possible at this stage, and that the north and south avenue would cost about £8,550,000 net. This amount represents £24,100,000 sterling for the two avenues; but other estimates, which they quote, point to the probability that the net cost would be considerably higher. On the other hand, the full effect of "recoupment" and "betterment" would reduce it, and some pecuniary return would be received from the tramways and railways.

It must be understood that the Advisory Board of Engineers do not themselves put forward their scheme of new avenues as a project for immediate accomplishment under existing conditions. They desire that its great utility should be realised, and that it should find a place in a general plan for the future development of London, as means and opportunity offer. The Commission recognise its utility to the full, and agree that it should find a place in the general plan, if further careful study of the project, from all points of view, shows that it is financially practicable. They do not, however, think that works of less magnitude, which may be within available resources, should be retarded in the expectation of its early accomplishment.

OTHER ARTERIAL ROADS.

Passing from the Main Avenues, other works in different parts of London are suggested by the Advisory Board of Engineers in their report with the general object of opening freer communication between important districts.

The Euston and Marylebone Roads from King's Cross to Stafford Street, a distance of about two miles, are, in places, much contracted. A continuous street of the first class might be provided without excessive expense, and would afford additional accommodation for the great railway termini in that district.

The report recommends also the continuation of the new first-class street from Marylebone Road to the Edgware Road, facing the Harrow Road.

The widening of Constitution Hill is suggested, so as to give full effect to the projected opening of the road between the Mall and Charing Cross, and provide a much-needed route, capable of accommodating a great amount of traffic from Charing Cross.

With a view to relieving Parliament Street, Charing Cross and Trafalgar Square, the report advises that a wide thoroughfare should be constructed along Prince's Street, Westminster.

Only one arterial street improvement in London south of the Thames is specifically alluded to, if the north and south Main Avenue be excluded, viz., the widening of Wandsworth Road from Putney to Lambeth, a distance of nearly five miles.

A POINT NEEDING IMMEDIATE ATTENTION.

The Advisory Board of Engineers draw special attention to four main lines of thoroughfare giving access to the west and south of London: the Bayswater Road, the Hammersmith Road, the Fulham Road, and the King's Road—Chelsea; including in the case of the Hammersmith Road, King's Street—Hammersmith. These roads are particularly important, not merely because of the great traffic which they already carry, and its probable increase, but also because they are routes specially suited for tramway service. We are told that they ought to be widened to the dimensions of a first-class street, that is, 100 ft. In any case, these four roads appear to require attention, without delay, at certain points: immediate steps ought to be taken to prevent any building taking place, beyond the future frontage lines, nearer to the existing roadway than the present line of houses; the longer these precautions are neglected, the greater will be the cost of widening.

No other suggestions of the Advisory Board of Engineers, with regard to arterial roads, require notice, except one relating to Brentford High Street, which lies outside the Administrative County of London.

TO DEAL WITH CROSS TRAFFIC.

At Blackfriars Bridge they recommend a viaduct at the centre arch carried north down the centre of New Bridge Street and Farringdon Street to terminate in Farringdon Street between Farringdon Avenue and Plum Tree Court: this viaduct would give a roadway of 33 ft. The work would involve widening the roadway of Blackfriars Bridge, and also widening Farringdon Street, and the cost is estimated at £700,000. The object of this improvement, as explained by the Advisory Board of Engineers, is, not only to relieve the congestion at Ludgate Circus, and the congestion between Victoria Embankment and Queen Victoria Street, but also to bring the tramways from the south side of the Thames across both points, and to connect them directly with the City in Farringdon Street, and join them with the northern system of tramway lines.

The report suggests a bridge across the Strand from the hill of Wellington Street, on the north, to the north end of Waterloo Bridge, on the south. The cost of this work is estimated at £325,000, after allowing for "recoupment."

The third suggestion is intended to relieve the notorious congestion in Piccadilly, where it is crossed by the north and south traffic from Berkeley Street and St. James's Street. The Advisory Board of Engineers recommend a sunken road, which should be made from Berkeley Street passing under Piccadilly: this would involve the purchase of valuable private property. No estimate of the cost of this improvement is given.

While giving the illustrations above noticed of works for the purposes of facilitating cross traffic, the Advisory Board of Engineers allude to other places where similar relief is needed, such as the Marble Arch, the north and south ends of Tottenham Court Road, Piccadilly Circus, Oxford Circus, and the Elephant and Castle; and this list is by no means exhaustive.

Relief in such cases could be afforded, either by raising or sinking one of the existing roads, or by enlarging the central space where the different lines of traffic converge. In most of the cases mentioned immediately above, the last-named method would be the most suitable, as may be realised by observing how slight, by comparison, the interruption is at places like Trafalgar Square, Parliament Street, and Hyde Park Corner.

Those who are familiar with London will at once perceive, what the Advisory Board of Engineers themselves point out, that, although the suggested improvements probably cover the most striking defects, there are others which have not been specified.

The Commission think all the proposals just referred to are valuable, and would produce beneficial results, and that they deserve careful examination by the authorities who may have to deal with the traffic of London, and find the necessary money, in order that the cost and disadvantages may be weighed against the benefits. They are unable to commit themselves to a final recommendation without fuller investigation than it has been practicable for them to undertake. These do not constitute, as does each of the Main Avenues, one great work which must be carried to completion as a whole. They can be executed one by one as resources become available.

Those who may have the responsibility of effecting improvements in the future will, of course, have to make their choice, and may possibly find that priority has to be given to other works more urgent than those which have been specified; but, upon the information available to them, the Commissioners feel justified in making the following recommendations:—

That, so far as practicable, a preference should be given to such street improvements as are indispensable for the development of a complete system of tramways throughout London. The whole question of tramways is dealt with in the ninth chapter, the Commission attaching great importance to them as a means of locomotion.

That, in regard to other improvements, those that will relieve the congestion at important places, where traffic crosses in different directions, should be speedily taken in hand.

That steps be taken at once for the purpose of preventing the creation of further obstacles to the future

widening of existing streets, with proper provision for compensation where legal rights are infringed.

BUILDING LAWS.

The Commission recommend that the Building Laws, and bye-laws made thereunder, in "Greater London," outside the Administrative County of London, should, as far as practicable, be made uniform. As regards the main thoroughfares leading out of London, the proposed Traffic Board should be requested to consider the whole question, and report to the Local Government Board, stating what, in its opinion, ought to be done in the way of making new roads and improving existing roads. The report should be accompanied by an estimate of cost.

GLARING TRAMWAY DEFECTS.

From every point of view, tramway accommodation is glaringly defective. In a great area there is no tramway service at all. Where there is such a service, travellers do not obtain the full advantage which it ought to provide in cheapness, expedition, and convenience. An "end-on" break in the course of a journey probably causes additional expense (for two independent fares usually cost more than a through fare), whilst the consequent delay and discomfort, especially in bad weather, and the uncertainty of trans-shipment, are great drawbacks. Where the line abruptly terminates in the middle of crowded streets even greater discomfort is caused, together with serious diminution of efficiency in the entire tramway service, and an intolerable congestion in the streets.

It is difficult to appreciate how such a state of things can have been tolerated so long. Whatever view may be held upon the expediency of extending tramways in London, it cannot be expedient to work those we have upon inefficient methods.

Considerable advance has been made in the use of motor omnibuses, but experience alone can finally determine the limits of their usefulness. On routes suitable for tramways, where there is a large traffic, the Commission are of opinion that tramways will continue to be the most efficient and the cheapest means of street conveyance.

PROPOSED TRAMWAY EXTENSIONS.

Increased modern means of locomotion and transport are much needed, both to facilitate movement within the central area, and to facilitate access to and from and within the suburbs for those who work in London and live outside. Electric tramways and railways are necessary for both these purposes; tramways mostly for the former, and railways mostly for the latter, with inter-connection between the two.

The tramways system should be largely extended, and the portions of the tramway system that are now

isolated should be linked together, through communication being provided from east to west, and from north to south.

It is believed that much could be done in tramway development without having recourse, at any rate in the first instance, to great and costly street improvements, but, as such improvements are unavoidable, in any case, the preference should be given to those which will facilitate the extension of the tramway system. The absolute "veto" over the construction of tramways possessed by local and street authorities should be abolished throughout the area of "Greater London," but with a preferential right to county councils, and the Corporation of the City of London, to construct tramways within their districts, if they are prepared to do so. Tramways should run through from side to side of London so far as possible, and termini, in the streets and central districts, should be avoided. The new routes suggested are: Across Hammersmith Bridge, from Hammersmith to Knightsbridge, Knightsbridge to Aldgate (subway), Fulham and Brompton Roads, Grosvenor Place and Hyde Park (*via* a subway), Edgware Road and Maida Vale, Harrow Road and Edgware Road, Cambridge Avenue and Edgware Road, Uxbridge and Bayswater Roads, Westminster Bridge Road and Victoria Embankment, Waterloo Bridge and Blackfriars Bridge (*via* Victoria Embankment), Queen Victoria Street and Southwark Bridge, New Bridge Street and Farringdon Street, Holborn and Charterhouse Street, York Road, Stamford Street, and Southwark Street, Tower subway under the Thames, Tottenham Court Road and Whitehall, Moorgate, Liverpool Street, and Norton Folgate, Aldersgate Street (subway), starting at terminus of tramway near Charterhouse Square, to Post Office, King's Road, Chelsea, and Buckingham Palace Road, Victoria Street, Westminster, Marylebone and Euston Roads, and Finchley Road. The Commissioners remark that the advantages of some of these routes are obvious.

LONDON RAILWAYS.

In regard to railways, their further development must be governed by the features of the existing and authorised systems, which should be extended and improved. Various extensions and improvements are suggested.

When the "tube" railways already authorised have been completed, with the addition of the line suggested from Victoria to the Marble Arch, the most pressing requirements of railway communication within the central area, as distinguished from the suburbs, will have been fairly provided for. Greater attention should, however, be paid to providing interchange stations, wherever lines running north and south intersect those running east and west; and that

wherever it is possible, this accommodation for the public should be afforded. In regard to both the suburban and central urban railway systems, there should be better connection to the north-east of London; and better connection between the suburban systems on the east and the suburban systems on the west, with the object of improving central urban communication, and providing passengers with fuller facilities than they now possess, by convenient interchange stations, for reaching all principal points within the central area served by the central urban railways.

In the more crowded parts of London, where property is expensive, railways must be placed underground. Railways in shallow subways are preferable to "tube" railways, where the cost is not prohibitive, or where other considerations do not render them impracticable. Urban railways, traversing London from side to side, on routes where there is a heavy traffic, should have four lines of way, in order to provide a separate service for fast and stopping trains, and thus admit, by means of a few interchange stations, of rapid transit to the suburbs from all the stations on the local service lines.

Owing to the high capital cost of "tube" railways, constructed under present conditions, there is a difficulty in providing a sufficient number of such railways to distribute population over the outlying districts, but the Commission are advised that it is possible to construct a cheaper type of deep-level railway adapted for suburban traffic, with fewer and less expensive stations, and rising to the surface when the open country is reached; such railways would help to solve the "housing problem" by carrying the population to districts not yet built over.

If private enterprise will not construct the necessary railways, the local authorities might be authorised to give assistance, in view of the fact that re-housing within the central area involves a heavy loss to the rates, and that it may be cheaper, and will be better in other respects, to help in making healthier residences in the suburbs accessible. Assistance might be afforded, either by remission of rates, or by direct contribution, according to the precedent of the Light Railways Act, 1896, and the recommendations of the Joint Committee of 1901 on London Underground Railways.

In cases where railways exist, but additional train services are required to open up new districts for building, and railway companies decline, and cannot under the existing law be compelled, to put on additional trains, local authorities might be empowered, if the necessity is urgent, to guarantee, for a limited period, such net receipts per train mile, for the proposed trains, as may be reasonable.

In cases where a new railway is proposed to be made, which would have the effect of opening out a district for building purposes, a railway company might be authorised to purchase, under proper safeguards, land, likely to be increased in value by the construction of the railway, by means of voluntary agreement with the owner of such land.

TRAFFIC REGULATION.

As no practicable improvement of the streets, that can be carried out for many years, will completely remove the congestion of street traffic, special attention should be given to: (1) Improved regulations for traffic. (2) The avoidance of certain oversights or defects in the construction and maintenance of the streets; the removal of fixed obstructions from them in certain cases; and the control, in the future, of the erection of such obstructions. (3) The introduction of a system for minimising the evils caused by the breaking up of the streets by persons and companies having statutory authority to do so. (4) Regulation of the use of the streets by costermongers and itinerant vendors. (5) The removal of special obstructions to traffic.

A comprehensive plan for the improvement and construction of main roads leading out of London should be prepared, and arrangements made for carrying out such plan, and for the proper maintenance of the roads when constructed. Improved building laws are required for application to districts not yet built over, and, possibly, it may be found expedient, in special cases, to prepare "building plans" for particular areas. The law affecting traffic, and prescribing the respective functions and powers of the municipal, local, and other authorities in "Greater London" should be simplified and consolidated.

PROPOSED TRAFFIC BOARD AND ITS FUNCTIONS.

A Traffic Board should be appointed with jurisdiction over "Greater London," its functions being of an advisory and semi-judicial character. It would make a yearly report to Parliament on locomotion, transport, or traffic in "Greater London," dealing with the whole subject, including such matters as the control of traffic, the regulation of the statutory powers of breaking up the streets for various purposes, the removal of any special obstructions to traffic, the provision of new lines of railway and tramway, and calling attention to any errors or oversights in the maintenance of streets and roads on the part of local or street authorities. It would also deal with the question of street improvements, including street widenings and the construction of new streets, as well as the provision of alternative routes, and of facilities for dealing with cross traffic.

The most important function of the Board would be the preliminary examination, before consideration by Parliament, of Bills seeking statutory powers for the construction or extension of works affecting the means of locomotion and transport in "Greater London." In cases of a difference of opinion between local authorities regarding their respective contributions to a public improvement or the division of any charge between them, the Board might, on the application of either party, inquire into and determine the matter, and its award should be treated as final and binding, if all parties had agreed beforehand to refer the matter to it. Among important questions on which the Traffic Board might be specially required to report, and on some of which the Commissioners think it should report, are: The improvement of the main roads leading out of London; the building laws as affecting districts not yet built over within the area of "Greater London"; the revision and amendment of the laws regarding the breaking up of the streets; and the consolidation and amendment of the laws affecting traffic. The Board proposed would consist of a chairman and not more than four nor less than two other members. They would be selected by Government and paid such salaries as would be sufficient to secure thoroughly competent men.

COAL MINING IN 1904.

THERE has been on the whole a steady increase in the numbers employed and output at coal mines since 1873, and the figures just published for 1904 are the greatest on record. Compared with 1873, the total number employed in 1904 shows an advance of about 65 per cent., and the output of about 80 per cent. The accident death rates among underground workers have declined fairly steadily, and are now but little more than one-half of what they were about thirty years ago. Excluding 16,488 tons obtained from quarries, the total output of coal in 1904 was 232,411,784 tons, an increase of 0.9 per cent. on the previous year. The increase in the total output of coal was greatest in the Cardiff, Southern, and East Scotland districts, while the chief decreases were in the Liverpool and North Wales and Stafford districts. There were 1,017 separate fatal accidents in 1904, causing 1,055 deaths, or 19 accidents and 17 deaths less than in 1903. Of the 1,055 persons killed, 71 were under 16 years of age. The accident death-rate among underground workers was 1.34 per 1,000 employed, compared with 1.35 in 1903, and among surface workers 0.85 per 1,000, compared with 0.94 in the previous year.

CONTRACTORS' NEWS.

We shall be pleased to insert under this column, free of charge, particulars of open contracts

CONTRACTS OPEN.

Caerphilly.—The Urban District Council invite tenders for supply, delivery, laying and erection of high and low-pressure underground cables, transformers, switch gear, lamp pillars, etc. ... July 24

Esk.—For the works to be executed in the construction of the steelwork required in the renewal of the superstructures of the eleven remaining spans of Esk Viaduct at 6 miles 50 chains on main line north of Carlisle, for the Caledonian Railway Co. Drawings may be seen at the office of the Company's District Engineer, Princes Street Station, Edinburgh. ... July 24

Worthing.—The following for the Corporation: (1) supply and erection of one dry-back marine type steam-boiler with fittings; (2) supply and erection of steam-feed, drain, and other piping; (3) supply of vulcanised bitumen-sheathed feeder and pilot cables; (4) supply of stoneware conduits. Resident Engineer, Generating Station, Worthing. ... July 24

Dublin.—Supply of three electric locomotives for haulage of refuse wagons on the city tramways; nearly 1,000 yards run of street tram tracks and electricity mains, overhead trolley wires, with street posts and connections; two electric and one steam capstan, etc., for the Cleaning Committee. City Engineer, Mr. Spencer Harty, City Hall, Dublin. ... July 25

London.—The London County Council invites tenders for the manufacture, supply, and delivery, separately, of (a) double-deck car bodies with roof covers; (b) maximum traction swing bolster trucks for electrical cars; (c) complete electrical equipments for cars, also supply, and delivery of (a) one five-ton overhead electrically driven travelling crane and (b) one 2½ ton overhead electrically driven travelling crane, for the London County Council. Tenders may, on and after 17th inst., obtain specifications, drawings, forms of tender, and other particulars at the County Hall, Spring Gardens, S.W. ... July 25

Malvern.—Construction of the rising main from Bromsberrow to the British Camp reservoir, and other contingent works for the Malvern Urban District Council. The work will be divided into two contracts, viz.: (Contract No. 3) 6,553 yards or thereabouts of 10-in. cast-iron pipe mains, complete; (4) 3,500 yards or thereabouts of 10-in. cast-iron pipe mains, complete. Also construction and erection of pumping machinery, including deep-well pumps, Lancashire boilers, and contingent works at their new pumping station, Bromsberrow Heath. (Mr. William Osborne Thorpe, surveyor and water-works engineer. ... July 26

Last Day.

Hull.—Supplying and fixing of the constructional steelwork, etc., for the new public hall, Hull, for the Corporation. Mr. Joseph H. Hirst, city architect, Town Hall, Hull. ... July 23

Glasgow.—Supplying two twin-screw steam hopper barges of 1,200 tons capacity each, for the Trustees of the Clyde Navigation. Mr. Geo. H. Baxter, mechanical engineer, 16, Robinson Street, Glasgow. ...

Waterford.—Works in connection with the new station at Waterford, for the Directors of the Great Southern and Western Railway Co. The works comprise the erection of station offices, platforms, roofs, etc., the diversion of public roads, including two girder bridges, and a ferro-concrete viaduct about 700 ft. long. About 350 tons of steelwork will be required. Office of Company's Engineer, Dublin. ... Aug. 1

Ebbw Vale (Mon.).—For the Ebbw Vale Urban District Council, four sections—(Section A) cables; (B) overhead lines; (C) street lamps and fittings; (D) meters. Mr. Reginald P. Wilson, 66, Victoria Street, Westminster. ... Aug. 5

Appleby (Lincs.).—Construction of a concrete and steel service reservoir in the parish of Appleby, in the county of Lincoln, for the Brumby and Frodingham Urban District Council. Mr. Alfred Atkinson, Brigg. ... Aug. 14

Carlisle.—Construction of a storage reservoir, etc., to contain about 180 million gallons, on the Castle Carrock Beck, about nine miles from Carlisle, for the Carlisle Corporation. Messrs. James Mansergh and Sons, 5, Victoria Street, S.W. ... Aug. 14

Skipton.—Construction of the embankment and other works for the formation of a reservoir on the Embsay Beck, about one mile distant from the Embsay railway station on the Midland Railway, between Skipton and Ilkley. Messrs. G. H. Bell and Sons, 5, Victoria Street, S.W. ... Aug. 21

Wolverhampton.—A vertical triple expansion pumping engine and other work connected therewith, for the Corporation of Wolverhampton. Mr. E. A. B. Woodward, waterworks engineer, Town Hall, Wolverhampton. ... Sep. 1

Merthyr Tydfil.—Erection of refuse destructor plant capable of effectually burning 120 tons of refuse per day, together with all buildings and contingent works connected therewith, for the Merthyr Tydfil Urban District Council. Mr. T. Fletcher Harvey, engineer and surveyor to the Council, Town Hall, Merthyr Tydfil. ... Sept. 1

COMING CONTRACTS.

Aberdeen.—Sir Benjamin Baker and the borough Surveyor have been instructed to furnish an estimate of the cost of reconstructing Union Bridge.

Altrincham.—The Council have applied for sanction to a loan of £18,895 for constructing the Altrincham section of the proposed extension of Manchester tramways.

Leek.—Application is to be made for sanction to borrow £2,000 for gasworks extensions.

Paisley.—The Gas Committee are considering a proposal to instal electric plant for supplying power for coke conveyors.

Tutbury.—An inquiry has been held into the application of the Council for sanction to borrow £5,650 for a water scheme.

Finchley.—An inquiry has been held into the application for sanction to borrow £23,500 for electric lighting purposes.

Louth.—An inquiry has been held into the application for sanction to a loan of £17,000 for the purposes of electricity supply.

Bradford.—The City Council have decided to construct six new settling tanks at the Frizinghall sewage works, at an estimated cost of £6,000.

Ipswich.—An inquiry has been held into an application of the Council for sanction to borrow £15,000 for purposes of electric light supply.

CONTRACTS CLOSED.

Burma Railways.—The Empire Roller Bearings Company have secured an order for 196 axle-boxes fitted with their roller bearings for 24 bogie coaches for use in suburban traffic on the Burma Railways.

Japan.—Messrs. Brown, Marshalls, and Co., Ltd., of Saltley, Birmingham, have received an order from the Japanese Government for 550 "provision wagons," forty to be delivered per month. The wagons are practically covered goods trucks, somewhat similar in pattern to the ordinary English type, but built to the Japanese standard railway gauge.

London.—In connection with the enlargement of Victoria Station, Messrs. Andrew Handyside and Co., Ltd., Britannia Ironworks, Derby, and Messrs. Head, Wrightson and Co., Ltd., Teesdale Works, Thornaby-on-Tees, are supplying the ironwork; Messrs. Galloways, Ltd., Manchester, boilers; the Phoenix Art Metal Engineering Company, Ltd., Coin Street, London, S.E., new gates; and Messrs. Cowans, Sheldon, and Co., Ltd., Carlisle, a 60-ft. turntable.

London.—The Underfeed Stoker Company, Ltd., are supplying two of their special stokers to the Bournemouth Gas and Water Company, one to the Newport Corporation, one to the Guildford Electricity Supply Company, and one to the Eastbourne Corporation.

Birmingham.—Messrs. Thwaites Brothers (Limited), of Bradford, have obtained the contract for the supply of seventeen steam hammers, varying in size from three tons to five cwt., for the equipment of the new works of the Metropolitan Amalgamated Railway Carriage and Wagon Company (Limited), of Birmingham. This firm has also in hand important orders of the same kind for the Imperial Japanese Government.

Gillingham.—The Council have accepted the tender of Babcock and Wilcox, at £1,010, for one water-tube boiler and superheater.

Lynmouth.—The following tenders have been accepted for a 100-kw. hydro-alternator; Escher, Wyss, and Co., Zurich, hydraulic portion; British Thomson-Houston Co., Rugby, alternator portion.

Bradford.—The Council have accepted the tender of the Webster Electrical Engineering Co., for the lighting of new Council schools by electricity.

Mitcham (Surrey).—The Guardians of the Holborn Union have accepted the tender of Ruston, Proctor, and Co., Ltd., at £723, for supplying and fixing at their workhouse, Western Road, Mitcham, Surrey, a new Galloway steam boiler.

Bombay.—The contract for the extension power house and substation plant, consisting of two 500-kw. steam turbo-electric generators, two 500-kw. motor-generators, two 50-kw. motor-generators, with boilers, condensers, switchboard, and accessories has been placed with the Brush Electrical Engineering Co.

APPOINTMENTS VACANT.

Cawnpore, India.—Assistant Municipal Engineer under the Municipality. Salary Rs. 375 a month and an agreement for five years. Mr. Frank E. Priest, 13, Harrington Street, Liverpool. ... July 31

London.—The County Council require tramway engineers, salary £7 per week. Apply, Clerk to the Council, Spring Gardens, S.W. ... July 24

Madras.—Assistant locomotive superintendent and chief locomotive draughtsman. Salaries, Rs. 350 per annum. Apply, Secretary, Madras Railway Company, 1, Broad Street Place, Finsbury Circus, E.C. ... July 27

Birkenhead.—Engineering assistant under Corporation, at a salary of £110 per annum. Apply, Town Clerk. ... July 29

Egypt.—An instructor in land surveying and farm engineering is required to begin work on September 30th in the School of Agriculture, Ghizeh (near Cairo). Salary about £295 per annum (£Eg. 24 per mensem), rising to about £393 per annum (£Eg. 32 per mensem). Also an instructor in engineering in the Polytechnic School of Engineering, Ghizeh. Salary about £430 per annum (£Eg. 35 per mensem), rising to about £553 per annum (£Eg. 45 per mensem). Apply to Mr. W. C. Mackenzie, 5, The Crescent, Cromer. ... July 22

Glasgow.—An appointment is vacant in the administrative department of the Glasgow and West of Scotland Technical College. Salary £300 per annum. The Secretary, Technical College, Glasgow. ... July 23

APPOINTMENTS FILLED.

Egypt.—The Corporation of Western Egypt have appointed as its general manager in Egypt Mr. W. C. Beckett, M.Inst.C.E.

Aston.—Mr. Joseph Dugdale has been appointed tramway manager to the Aston Corporation, vacant by the retirement of Mr. A. Coveney. Mr. Robert Foster has been appointed resident electrical engineer at Aston, at a salary of £300 per annum.

Ceylon.—Mr. Henry B. Lees, one of the senior engineering assistants in the borough engineer and surveyor's office, Birkenhead, has been appointed district engineer in the Public Works Department of Ceylon.

Share List of Engineering, Electrical, Iron and Steel, and other Companies.

The following is a comprehensive list of Companies in the industries covered by "Page's Weekly," in which shares business is being currently transacted. Additions will be made from time to time as occasion requires. We desire it to be understood that while our Share List will generally be correct, we do not hold ourselves responsible for any loss or inconvenience that may arise from possible inaccuracies.

STOCK EXCHANGE SETTLING DAYS.—Settling days on the Stock Exchange are as follows:—

Consols: Aug. 3rd, Sept. 1st. General Settlements: July 28th, August 16th, 31st. Bank Rate, March 9th, 1905, 2½ per cent.

I.—ENGINEERING, IRON, AND STEEL COMPANIES.

ENGINEERING, IRON, AND STEEL COMPANIES.—Contd.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.	Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
11,370	5	5%	Alldays & Onions Pneumatic Engineering, Ltd.	3	12-22	750,000	1	7½%	Howard & Bullough, Ltd., Ord.	1	18-13*
10,000	5	3/-	Do. Cum. Pref. 6 per cent.	5	42-42	25,000	10	6/-	Do. 5% Pref. (Non-Cum.)	10	123-131
8,210,000	1	1/-	Armstrong (Sir W. G.), Whitworth and Co., Ltd.	1	33-35	£250,000	Stk	4%	Do. 4% Deb. Stk., Red. after 1905	100	95-38*
76,970	5	2/-	Do. 4% Cum. Pref.	5	58-64	37,500	10	20	Kynoch, Ltd.	10	174-173*
1,500,000	100	4%	Do. 4% 1st Mort. Dbs. Rd.	100	102-104	49,587	10	5%	Do. Cum. Pref. 5%	10	103-102
£100,000	100	4½%	Aveling and Porter, Ltd., 4½% Reg. Mt. Dbs. Red.	100	96-99	300,000	1	4½d.	Lambert Bros., Ltd., Ord.	1	2-2
580,000	1	2½d.	Babcock and Wilcox, Ltd., Ord.	1	82-82	50,000	5	2½d.	Do. 5½% Cum. Pref.	5	4-4
100,000	1	7½d.	Do. 6% Cum. Pref.	1	12-12	40,000	1	2½d.	Leeds Forge Co., 7% Cum. Pref.	3	78-80a
20,000	5	8/-	Baker (Joseph) and Sons, Ltd., 6% Cum. Pref.	5	42-52	200,000	1	7½d.	Lysaght (John), Ltd., 6% Cum. Pf.	1	1-1
250,000	1	6½d.	Baldwins, Ltd., 5½% Cum. Pref.	1	1-1	£300,000	Stk	4½%	Do. 4½% 1st Mt. Deb. Stk., Red.	100	107-109
£250,000	Stk	4½%	Barrow Hematite Steel Co., Ltd., O.	4½	12-12	40,000	10	5/-	Mather & Platt, Ltd., 5% Cum. Pref.	10	112-12
150,000	4½	2½d.	Do. 6% Cum. Pref.	4½	42-42	210,000	1	8½d.	Measures Bros., Ltd., Ord.	1	2-2
50,000	4½	3/-	Bayliss, Jones and Bayliss, Ltd., 5% Cum. Pref. Shares	5	42-52	75,000	1	6½d.	Do. 5½% Cum. Pref.	1	12-12
83,334	5	2½d.	Beardmore (Wm.) & Co., Ltd., 4½% 1st Mt. Dbs., Red. Scrip 50% pd	—	103-105	£75,000	Stk	4½%	Do. 4½% 1st Mrt. Db. Stk., Red.	100	92-95
£500,000	100	4½%	Bell Brothers, Ltd., 6% Cum. Pref.	100	12-12½	21,948	5	2½d.	Muntz Metal, Ltd.	5	42-52
50,000	10	6/-	Do. 4% Deb. Stock, Red.	100	92-100	14,248	5	5%	Do. Pref. 5%	5	42-52
£366,600	Stk	4%	Beyer, Peacock and Co., Ltd., Ord.	1	12-12	5,000	62½	47½	Nantyglo and Blairston Iron Works, Ltd., 8% Cum. Pref.	62½	79-81
200,000	1	1/-	Do. 5½% Cum. Pref.	1	12-12	£50,000	5	—	North-Eastern Steel Co., Ltd., 4½% 1st Mrt. Db. Stk., Red.	100	124-123
900,000	1	6½d.	Do. 4½% Red. Deb. Stock	100	94-97	£250,000	Stk	4½%	Pearson & Knowles Coal and Iron Co., Ltd., Ord., "B"	5	34-37
£300,000	Stk	4½%	Bolckow, Vaughan and Co., Ltd., O.	1	12-1	122,000	5	1½	Do. 6% Cum. Pref. "A"	5	62-62
1,639,760	1	6d.	Do. Nos. 1,639,760-2,500,000	12½	12-12	50,000	5	3/-	Pease & Partners, Ltd., Ord.	10	92-92
1,860,900	1	8½d.	Brown (John) and Co., Lim., Ord.	15½	12-12	70,000	10	6/-	Do. 4% Perp. Deb. Stock	100	97-100
1,160,000	1	4½d.	Do. Ord., Nos. 1,160,000-1,750,000	1	12-12	£100,000	Stk	4%	Peebles (Bruce) & Co., Ltd., 6% Cum. Pf.	5	5-5
590,000	1	6d.	Do. 5% Cum. Pref.	5	82-82	20,000	5	3/-	Pooley (Henry) & Son, Ltd., Ord.	1	6/-6/6
74,000	10	5/-	Camell, Laird & Co., Ltd., Ord.	5	82-82	13,000	5	—	Do. 5½% Cum. Pref.	5	37-42
154,500	5	5/-	Do. 5% Cum. Pref.	5	52-54	230,000	1	—	Projectile Co. (1902), Ltd., Ord.	1	5-5
232,500	5	2½d.	Clayton & Shuttleworth, Ltd., Ord.	100	100-102	126,988	5	2½d.	Rhymney Iron Co., Ltd.	5	12-12
450,000	1	1½d.	Do. 5% Cum. Pref.	100	100-102	73,062	5	5/-	Do. New	5	12-12
70,000	5	2½d.	Consett Iron Co., Ltd., Ord.	7½	82-82	£380,000	—	5%	Do. 5% Mort. Deb. Red.	100	99-101
£250,000	Stk	4%	Crossley, Bros., Ltd., Ord. 40340/97370	10	112-114	350,000	1	7½d.	Richardsons, Westgarth & Co., Ltd., Ord. 350,001-700,000	1	32-37
100,000	10	7/-	Do. 5% Cum. Pref.	10	112-114	£350,000	Stk	4½%	Do. 4½% Perp. Deb. Stock	100	93-95
57,031	10	10/-	Delta Metal, Ltd. Shares	1	22-28	35,000	10	12½	Ruston, Proctor & Co., Ltd., —	10	94-10
40,389	10	5%	Dorman, Long & Co., Ltd.	1	22-28	275,000	1	6d.	Scott (Walter) Ltd., Ord.	1	8-8
75,000	1	2½d.	Dunlop (James) & Co., Ltd., Ord.	1	22-28	300,000	1	7½d.	Do. 6% Cum. Pref.	1	12-12
1,269,594	1	3½d.	Do. 4% 1st Mort. Perp. Deb. Stk.	100	87-91	£300,000	Stk	4%	Do. 4% Perp. Deb. Stk.	100	92-94*
£400,000	Stk	4%	Dunderland Iron Ore Co., Ltd., 6% Cum. Pref. and Participating	5	22-82	£115,300	100	5%	Shelton Iron, Steel and Coal Co., Ltd. 1st Charge 5% Dbs. Red.	100	90-98
200,000	5	3/-	Dunlop (James) & Co., Ltd., Ord.	1	22-82	£97,900	100	6%	Do. 6% 2nd Mort. Dbs. Red.	100	91-95
250,000	1	9½d.	Do. 6% Cum. Pref.	1	22-82	250,000	1	1/-	South Durham Steel & Iron, Ltd. O.	1	12-12
900,000	1	7½d.	Ebbw Vale Steel, Iron & Coal Co., Ltd.	13	84-92	300,000	1	1½d.	Do. 6% Cum. Pref.	1	2-2
4,721	18	13/-	Do. do. do.	10	62-7	£300,000	Stk	4½%	Do. 4½% Per. Deb. Stock	100	90-98
69,754	13	10/-	Elliott's Metal, Ltd.	8	42-54	49,560	10	2½d.	Steel Co. of Scotland Ord. 1/49560.	9	58-62
20,250	10	3/-	Do. Cum. Pref. 5%	10	82-92	£125,240	Stk	5%	Do. 5% Trust Mort. Deb.	10	105-106
5,000	10	5%	Do. Deb. 4%	100	90-94	25,000	10	—	Stephenson (Robert) & Co., Ltd., O.	10	22-24
186,748	Stk	4%	Fairfield Shipbuilding & Engng. Co., Ltd., 6% Cum. Pref.	10	11-11½	£250,000	Stk	4%	Do. 5½% Cum. Pref.	10	4-4
25,000	10	6/-	Do. 4½% Mort. Deb. Stk. Red.	100	100-103	85,000	10	9/-	Do. 4½% Perp. Deb. Stock	100	76-79
£250,000	Stk	4½%	Fleming & Ferguson, Ltd. Ord. Nos. 1/9000.	10	124-124	55,000	10	6/-	Stewarts & Lloyds, Ltd., Ord.	10	172-184
9,000	10	10%	Do. 5% Cum. Pref. Nos. 9001/15000	10	92-10	634,732	1	6d.	Do. 6% Cum. Pref.	10	142-143
6,000	10	5%	Fraser & Chalmers, Ltd., Ord.	8	34-41	538,845	1	6d.	Richardson, Lim. Ord.	1	3-3
126,000	3	3/-	Do. 7½% Cum. Pref.	3	52-6	£240,000	Stk	4½%	Do. 5% Cum. Pref.	1	4-1
21,000	3	1½	Galloway, Ltd., 5% Cum. Pref.	10	6-7	300,000	1	6d.	Do. 4½% 1st Mort. Deb. Stk. Red.	100	96-99
10,000	10	5%	Greenwood & Batley, Ltd., Ord.	10	52-52	£200,000	100	4%	Thames Iron Works, Shipbuilding & Engineering Co., Ltd., 5% Cum. Pf.	1	2-2
£110,000	Stk	4%	Guest, Keen & Nettlefolds, Ltd. Ord.	1	10-10½	£148,500	1	7½d.	Do. 4% Irredeem. 1st Mort. Deb.	100	76-80
16,800	10	10/-	Do. 5% Cum. Pref.	100	82-82	£160,000	1	7½d.	Thornycroft (John I.) & Co., Ltd. O.	1	3-3
965,000	1	7%	Hadfield's Steel F'ry Co., Ltd., Ord.	1	3-3	10,000	10	5/-	Do. do. 6% Cum. Pref.	1	12-12
344,000	5	2½d.	Hall (J. & E.), Ltd. 6% Cum. Pref.	5	5-5	£508,952,000	£1000	5%	Taylor (J.) & Sons, Ltd. 5% Cum. Pf.	10	92-92
£1,850,500	Stk	4%	Harvey United Steel Co., Ltd.	1	1-1	£3,500,000	£1000	5%	United States Steel Corp. Com. Stk.	£100	352-354
13,000	5	2½d.	Hawthorn, Leslie & Co., Ltd. Ord.	10	37-39	£162,268,000	£1000	5%	Do. 7% Cum. Pref. Stock	£100	105-105½
250,000	10	4½d.	Head, Wrightson & Co., Ltd.	5	42-52	£750,000	1	1½	Do. 10% Div. 5% Skg. Fd. G. Bds.	£1000	97-99
20,000	10	4½d.	Hill (Richard) & Co. (1899) Ltd., Ord.	1	12-12	£750,000	Stk	5%	Vickers, Sons & Maxm., Ltd. Ord.	1	1-1
408,505	5	9/-	Do. 6% Cum. Pref.	5	42-52	£1,250,000	Stk	4½%	Do. 5% Non-Cum. Pref.	1	1-1
47,500	10	7½d.	Hornsby (Richard) & Sons, Ltd., Ord.	100	98-100	£1,000,000	100	4½%	Do. 5% Non-Cum. Pref. Stock	100	112-121
28,001	5	7/-	Do. 6% Cum. Pref.	5	42-52	£225,000	1	1½d.	Do. 4% 1st Mort. Deb. Stk. Red.	100	104-106
85,000	1	7½d.	Do. 6% Cum. Pref.	5	42-52	500,000	1	7½d.	Do. 4½% 2nd Mort. Dbs. Red.	100	105-107
18,000	5	8/-	Do. 6% Cum. Pref.	5	42-52	£300,000	Stk	4½%	Weardale Steel, Coal & Coke, Ltd., Def. Ord.	1	12-12
£10,000	Stk	6%	Hornsby (Richard) & Sons, Ltd., Ord.	100	98-100	7,637	5	2½d.	Do. 6% Cum. Pref. Ord.	1	12-12
						66,666	5	3/-	Do. 4% Perpetual Deb. Stock	100	84-87
						£246,641	Stk	4½%	Willans & Robinson, Ord.	5	44-42
						£150,000	Stk	4½%	Do. 6% Cum. Pref.	5	92-98
									Do. 4% 1st Mort. Deb. Stk. Red.	100	73-78
									Do. 4½% 1st Mort. Deb. Stk. Red.	100	74-76

Stocks and Shares marked * are quoted ex-dividend.

II.—ELECTRICAL MANUFACTURING COMPANIES.

ELECTRIC TRACTION.—Contd.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
70,000	1	6d.	Alliance Elec. Co., Ltd. 5% Cum. Pf.	1	8-2
125,000	1	7 1/2d.	Aron Elec. Meter Ltd., 6% Cum. Pf.	1	18-1 1/2
120,000	1	1 1/2d.	Bell's Asbestos Co., Ltd.	1	18-1
100,000	5	4/-	British Insulated & Helsby Cables Ltd., Ord.	5	5 1/2-6
100,000	5	3/-	Do. 6% Cum. Pref.	5	5 1/2-6
£500,000	Stk	4 1/2%	Do. 4 1/2% 1st Mort. Deb. Stk. Rd.	100	101-104
£200,000	Stk	4 1/2%	British Thomson-Houston Co., Ltd. 4 1/2% 1st Mort. Deb. Stk. Rd.	100	100-102
400,000	5	8/-	British Westinghouse Electric and Manufac. Co., Ltd., 5% Pref.	5	2 1/2-2 1/2
£616,358	Stk	4%	Do. 4% Mort. Deb. Stk. Rd.	100	87-89
105,781	2	2/-	Brush Elec. Enging. Co., Ltd., Ord.	2	1-1 1/2
150,000	2	2 1/4%	Do. 6% Pref.	2	1-1 1/2
£125,000	Stk	4 1/2%	Do. 4 1/2% Perp. 1st Deb. Stk.	100	92-95
£125,000	Stk	4 1/2%	Do. 4 1/2% Perp. 2nd Deb. Stk.	100	77-80
35,000	1	7/6	Callender's Cable & Constn. Ltd., Ord.	1	10-11
40,000	5	2/6	Do. 5% Cum. Pref.	5	5 1/2-5 1/2
£220,000	Stk	4 1/2%	Do. 4 1/2% 1st Mort. Deb. Stk. Rd.	100	106-108
85,000	1	1/6	Crompton & Co., Ltd.	1	94-99 1/2
£100,000	—	5%	Do. 5% 1st Mort. Reg. Debs.	100	74-82
52,000	5	10/-	Dick, Kerr & Co., Ltd., Ord.	5	5 1/2-6
61,000	5	8/-	Do. 6% Cum. Pref.	5	5 1/2-6
£300,000	Stk	4 1/2%	Do. 4 1/2% Deb. Stock, Red.	100	104-106
233,334	1	6d.	Doulton & Co., Ltd., 5% Cum. Pref.	1	1 1/2-1 1/2
£233,334	Stk	4%	Do. 1st Mort. 4% Free Deb. Stk.	100	106-109
99,261	5	1/6	Edison and Swan United Electric Light, Ltd., "A" Shares	5	1 1/2-1 1/2
17,139	5	2/6	Do. "A" Shares Nos. 01-017,139	5	2-2 1/2
£344,023	Stk	4%	Do. 4% Deb. Stock Red.	100	83-88
£100,000	Stk	5%	Do. 5% Second Deb. Stk. Red.	100	89-94
112,100	2	1 1/4%	Electric Construction Co., Ltd.	2	2-2 1/2
81,890	2	2 1/2%	Do. 7% Cumulative Pref.	2	1 1/2-2 1/2
£200,000	Stk	4%	Do. 4% Perp. 1st Mt. Deb. Stk.	100	93-96
10,248	10	7/6	Evered and Co., Ltd.	10	11-13
£100,000	Stk	5%	Ferranti, Ltd., 5% 1st Mort. Deb. Stock, Red.	100	90-95
25,000	10	5/-	Gen. Elect. Co. (1900), Ltd., 5% Cum. Pref.	10	94-10
£200,000	Stk	4%	Do. 4% 1st Mt. Deb. Stk. Red.	100	97-101
35,000	5	10/-	Henley's (W. T.) Telegraph Works Co., Ltd., Ord.	5	11 1/2-12 1/2
35,000	5	2/8	Do. 4 1/2% Cum. Pref.	5	5 1/2-5 1/2
£50,000	Stk	4 1/2%	Do. 4 1/2% Mt. Deb. Stk. Red.	100	109-111
50,000	10	5/-	India Rubber, Gutta Percha & Telegraph Works Co., Ltd.	10	15 1/2-16 1/2
£300,000	100	4%	Do. 1st Mort. Deb. Red.	100	100-103
7,500	10	—	Parker, Thos., Ltd.	10	6 1/2-7
100,000	1	3%	Scott (Ernest) & Mountain, Ltd., Ord.	1	16 1/2-16 1/2
37,350	12	24/-	Telegraph Construction and Maintenance Co., Ltd.	12	81-83
£150,000	100	4%	Do. 4% Deb. Bonds	100	101-103

III.—ELECTRIC TRACTION.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
120,000	5	5/-	Anglo-Argentine Trams Co., Ltd., Ord.	5	5 1/2-5 1/2
260,007	5	2/6	Do. 5% Cum. Pf.	5	5 1/2-5 1/2
£230,000	Stk	6%	Do. Permanent 6% Debenture Stock, 1888	100	141-144
20,000	10	12/-	Barcelona Trams Co., Ltd., Ord.	10	13 1/2-13 1/2
10,000	10	5/-	Do. 5% Cum. Pf. Shares	10	9 1/2-10
£16,800	100	5%	Do. 5% Debs., Red.	100	99-102
£191,826	Stk	4 1/2%	Do. 4 1/2% Red. Deb. Stk.	100	98-103
75,606	1	—	Bath Elec. Trams, Ltd., Pf. Ord.	1	1 1/2-1 1/2
59,394	1	11 1/2d.	Do. 5% Cum. Pf.	1	1 1/2-1 1/2
75,000	5	—	Brisbane Electric Tram Investment Co., Ltd., Ord.	5	1-1 1/2
75,000	5	2/6	Do. 5% Cum. Pf.	5	8 1/2-4 1/2
£425,000	Stk	4 1/2%	Do. 4 1/2% 1st Deb. Stk. Red.	100	92-95
£200,000	Stk	6%	Brit. Columbia Elec. Rly. Co., Ltd., Def. Ord. Stock	100	105-108
133,801	10	6/-	Do. Pref. Ord. Stock	100	98-101
156,487	10	6/-	Brit. Electric Traction, Ltd., Ord.	10	9 1/2-9 1/2
£1,000,000	Stk	5%	Do. 5% Cum. Pref.	10	11 1/2-11 1/2
£250,000	Stk	4 1/2%	Do. 5% Perp. Deb. Stk.	100	122-121
100,000	5	2/6	Do. 4 1/2% 2nd Deb. Stk. Red.	100	97-99
40,500	5	3/-	Buenos Ayres & Belgrano Electric Trams, Ltd., Ord.	5	3 1/2-3 1/2
27,000	5	3/-	Do. "A" 6% Cum. Pref.	5	5 1/2-5 1/2
			Do. "B" do.	5	6-5 1/2

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
£200,000	Stk	5%	Buenos Ayres Elec. Trams Co. (1901) Ltd., 5% Db. Stk. Red.	100	96-98
£220,000	100	6%	Buenos Ayres Gd. Nat., Ltd., 6% 1st Deb. Bds.	100	99-102
102,268	5	5/-	Calcutta Tramways Co., Ltd.	5	3 1/2-3 1/2
£350,000	Stk	4 1/2%	Do. 4 1/2% 1st Deb. Stk. Red.	100	106-108
480,000	1	6d.	Cape Electric Tramways, Ltd.	1	1 1/2-1 1/2
40,000	5	2/6	City of Birmingham Trams Co., Ltd., 5% Cum. Pref.	5	4 1/2-5 1/2
£200,000	100	4%	Do. 4% 1st Mort. Debs.	100	99-102
£120,000	Stk	5%	Colombo Elec. Tram. & Light. Co., Ltd., 5% 1st Mort. Deb. Stk. Red.	100	102-104
60,000	10	6/-	Dublin United Trams Co. (1899), Ltd., Ord.	10	13 1/2-14 1/2
59,987	10	6/-	Do. 6% Pref.	10	15-16
30,000	5	2/6	Isle of Thanet Elec. Trams. and Light. Co., Ltd., 5% Cum. Pref.	5	2 1/2-3 1/2
£150,000	Stk	4%	Do. 4% Deb. Stock	100	83-88
125,000	10	5/-	London United Trams (1901), Ltd., 5% Cum. Pref.	10	9 1/2-10
£1,031,000	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red.	100	98-101
£50,000	Stk	5%	Madras Electric Trams (1904), Ltd., 5% Deb. Stock, Red.	100	101-103
314,016	1	—	Metropolitan Elec. Trams, Ltd., Def.	1	1 1/2-1 1/2
500,000	1	6d.	Do. 5% Cum. Pref.	1	1 1/2-1 1/2
£350,000	Stk	4 1/2%	Do. 4 1/2% Deb. Stock, Red.	100	104-106
50,000	5	6/-	New General Traction Co., Ltd., 6% Cum. Pref.	5	4 1/2-5 1/2
110,923	8	9 1/2d.	North Metropolitan Tramways Co.	8	4 1/2-5
£150,000	100	3 1/2%	Do. 3 1/2% Mort. Debs.	100	90-95
£196,200	Stk	5%	Perth Electric Trams, Ltd. (W.A.), 5% 1st Mort. Deb. Stock, Red.	100	103-106
24,500	10	10/-	Potteries Elec. Traction Co., Ltd., Ord.	10	8 1/2-9 1/2
24,500	10	5/-	Do. 5% Cum. Pref.	10	9 1/2-9 1/2
£220,000	Stk	4 1/2%	Do. 4 1/2% Deb. Stk., Red.	100	101-104

IV.—ELECTRIC LIGHTING AND POWER.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
7,500	10	14/-	Bournemouth & Poole Elec. Sup. Co., Ltd., Ord.	10	11 1/2-12 1/2
7,500	10	4/6	Do. 4 1/2% Cum. Pref.	10	10-10 1/2
7,500	10	6/-	Do. 6% Cum. Second Pf.	10	11 1/2-12 1/2
£270,000	Stk	4 1/2%	Do. 4 1/2% Deb. Stock Red.	100	106-108
14,000	5	3/6	Bromley (Kent) Elec. Lt. & Pr. Co. Ltd.	5	5 1/2-5 1/2
£50,000	Stk	4 1/2%	Do. do. 4 1/2% 1st Deb. Stk. Red.	100	103-106
27,507	5	5/6	Brompton & Kensington Elec. Supply Co., Ltd., Ord.	5	9 1/2-10 1/2
12,498	5	3/6	Do. 7% Cum. Pref. Shares.	5	9-10
60,000	5	5/-	Calcutta Elec. Sup. Cor. Ltd., Ord.	5	9-9 1/2
£288,782	Stk	4%	Central Elec. Sup. Co., Ltd., 4% Gns. Deb. S. k.	100	103-106
70,000	5	4/-	Charing Cross & Strand Elec. Sup. Corp., Ltd., Ord.	5	6 1/2-7 1/2
80,000	5	2/8	Do. do. 4 1/2% Cum. Pref.	5	5 1/2-5 1/2
£350,000	Stk	4%	Do. do. 4% Deb. Stk. Red.	100	104-106
41,436	5	3/9	Chelsea Elec. Sply. Co., Ltd., Ord.	5	6-6 1/2
£150,000	Stk	4 1/2%	Do. do. 4 1/2% Deb. Stk. Red.	100	108-110
70,595	10	7/-	City of London El. Light. Co., Ltd., O.	10	10 1/2-11 1/2
40,000	10	6/-	Do. 6% Cum. Pref.	10	13-14
£400,000	Stk	5%	Do. 5% Deb. Stk. Red.	100	122-126
£300,000	Stk	4 1/2%	Do. 4 1/2% 2nd Deb. Stk. Red.	100	103-105
40,000	10	5/-	County of London Elec. Supply Co., Ltd., Ord.	10	7 1/2-8 1/2
30,000	10	6/-	Do. 6% Cum. Pref.	10	11 1/2-12 1/2
£400,000	Stk	4 1/2%	Do. 4 1/2% Deb. Stk. Red.	100	111-114
70,000	5	2/6	Edmundson's Elec. Cor. Ltd., Ord.	5	5 1/2-6 1/2
70,000	5	3/-	Do. 6% Cum. Pref.	5	6-6 1/2
£300,000	Stk	4 1/2%	Do. 4 1/2% 1st Mort. Db. Stk. Reg.	100	105-107
£80,000	Stk	5%	Electric Lighting & Traction Co. of Australia, Ltd. 5% Deb. Stk. Red.	100	85-90
19,000	5	1/6	Folkestone Elec. Supply Co., Ltd., O.	5	6 1/2-5 1/2
£50,000	Stk	4 1/2%	Do. 4 1/2% 1st Deb. Stk. Red.	100	101-104
15,000	10	—	Havana Electricity Co., Ltd.	10	9 1/2-10 1/2
19,000	5	5/-	Hove Elec. Lighting Co., Ltd., Ord.	5	7 1/2-8 1/2
£50,000	Stk	4 1/2%	Isle of Wight Electric Light & Power Co., Ltd. 4 1/2% Deb. Stock, Red.	100	100-103
150,000	1	—	Kalgoorlie Electric Power & Lighting Corp. Ltd., 6% Cum. Pref.	1	3-3 1/2
21,000	5	7/-	Kensington and Knightsbridge Electric Lighting Co., Ltd., Ord.	5	11 1/2-12 1/2

Stocks and Shares marked * are quoted ex-dividend.

ELECTRIC LIGHTING AND POWER.—Contd.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
\$185,000	Stk	4%	Kensington and Knightsbridge Electric Lighting Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd., 4% Deb. Stock, Red.	100	102—104
111,000	8	1 9/8	London Elec. Supply Corp., Ltd., Ord.	8	2—2 1/2
60,000	5	3/-	Do. 6% Pref.	5	4 1/2—5 1/2
\$371,895	Stk	4%	Do. 4% 1st Mort. Deb. Stk., Red.	100	99—101
100,000	10	1 1/2	Metropolitan Elec. Sup. Co., Ltd., Ord.	10	9 1/2—9 3/4
76,121	5	2 3/8	Do. 4 1/2% Cum. Pref.	5	5 1/2—5 3/4
220,000	Stk	4 1/2%	Do. 4 1/2% 1st Mort. Deb. Stk., Red.	100	109—113
250,000	Stk	3 1/2%	Do. 3 1/2% Mort. Deb. Stk., Red.	100	98—103
\$250,000	—	4 1/2%	Midland Elec. Corp. for Power Distribution, Ltd., 4 1/2% 1st Mort. Deb.	100	99—101 1/2
10,852	10	8/-	Notting Hill Elec. Ltg. Co. Ltd. Ord.	10	14—15
\$59,000	100	4%	Do. 4% 1st Mort. Debs.	100	100—102
16,500	5	4 1/8	Oxford Electric Co. Ltd., Ord.	5	6 1/2—7
\$50,000	Stk	4%	Do. 4% Debenture Stk., Red.	100	98—100*
\$84,700	100	4 1/2%	Royal Elec. Co. (of Montreal) 4 1/2% 20-yr. 1st Mort. Deb.	100	101—104
40,000	5	9/8	St. James' & Pall Mall Elec. Light Co., Ltd. Ord.	5	19 1/2—19 3/4
20,000	5	3/8	Do. 7% Pref.	5	4 1/2—5
\$150,000	Stk	8 1/2%	Do. 8 1/2% Deben. Stock, Red	100	97—99
12,000	5	4/-	Smithfield Markets Elec. Supply Co., Ltd. Ord.	5	2 1/2—3
\$50,000	Stk	4%	Do. 4% Debenture Stk., Red.	100	78—82
65,000	5	4/-	South London Elec. Sup. Co., Ltd. O.	5	8 1/2—9
100,000	1	—	South Metropolitan Elec. Light & Power Co., Ltd. Ord.	1	3 1/2—4
50,000	1	8 1/2d.	Do. 7% Cum. Pref.	1	1 1/2—1 3/4
\$100,000	Stk	4 1/2%	Do. 4 1/2% 1st Deb. Stock Red.	100	105—108
50,000	5	2 1/8	Urban Electric Supply Co., Ltd., O.	5	4 1/2—4 3/4
97,000	5	2 1/8	Do. 5% Cum. Pref.	5*	5 1/2—5 3/4
\$200,000	Stk	4 1/2%	Do. 4 1/2% 1st Mort. Deb. Stk. Red.	100	104—106
110,000	5	7/8	Westminster Elec. Supply Corp. Ltd., Ord.	5	12—13
28,151	5	2 1/8	Do. 5% Cum. Pref.	5	6 1/2—6 3/4

V.—TELEGRAPH & TELEPHONE COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
\$34,800	100	4%	African Direct Tel. Co., Ltd., 4% Mt. Debs. (Series A), Red.	100	98—101
25,000	10	—	Amazon Telegraph Co., Ltd., ..	10	24—2 1/2
\$763,580	Stk	15/-	Anglo-American Tel. Co., Ltd., Ord.	100	59—61
\$3,118,210	Stk	30/-	Do. 6% Preferred Ordinary	100	106—107
\$3,118,210	Stk	2/-	Do. Deferred Ordinary	100	14 1/2—14 3/4
44,000	5	3/-	Chill Telephone Co., Ltd., ..	5	7—7 1/2
\$15,000,000	\$100	3 1/2	Commercial Cable Co., Capital Stk.	\$100	96 1/2—98 1/2
\$1,903,856	Stk	4%	Do. Sterl. 500-yr 4% Deb. Stk., Red.	100	8—8 1/2
16,000	10	5/-	Cuba Submarine Tel. Co., Ltd., Ord.	10	17—18
6,000	10	10/-	Do. 10% Preference	10	3 1/2—3 3/4
6,000	5	2/-	Direct Spanish Telegraph Co., Ord.	5	9—9 1/2
\$30,000	50	4 1/2%	Do. 4 1/2% Cum. Preference	50	100—109 1/2
60,710	30	3/-	Direct U.S. Cable Co., Ltd., ..	20	11 1/2—11 3/4
\$85,500	100	4 1/2%	Direct West India Cable Co., Ltd., 4 1/2% Reg. Debs.	100	99—101
\$300,000	100	4%	East. & S. African, Ltd., 4% Mt. Debs.	100	101—103
\$200,000	25	4%	Do. 4% Rg. Mt. Debs. (Mauritius Subsidiary)	25	100 1/2—102 1/2
300,000	10	2 1/8	Eastern Extension, Australasia and China, Ltd., ..	10	13 1/2—14 1/2*
\$602,400	Stk	4%	Do. 4% Mort. Deb. Stk., Perp.	100	106—108
\$4,000,000	Stk	25/-	Eastern Tele. Co., Ltd., Ord.	100	141—144
\$2,000,000	Stk	17 1/8	Do. 8% Pref.	100	89—91*
\$1,886,814	Stk	4%	Do. 4% Mort. Deb.	100	107—109
150,000	10	5/-	Great Northern Telegraph Co., Ltd., (of Copenhagen)	10	85—86
\$58,700	100	4 1/2%	Halifax and Bermudas Cable Co., Ltd., 4 1/2% 1st Mort. Debs. Red.	100	99—101
17,000	25	12 1/8	Indo-European Tele. Co., Ltd., ..	25	50 1/2—52 1/2
72,780	1	7 1/2d.	Monte Video Telephone Co., Ltd., O.	1	2—2 1/2
\$1,983,338	Stk	6%	National Telephone Co., Ltd., Pref.	100	111 1/2—112 1/2
\$1,966,667	Stk	5%	Do. Deferred	100	107 1/2—109 1/2
250,000	5	2 1/8	Do. 5% Non-Cum. 3rd Pref.	5	5 1/2—5 3/4
\$2,000,000	Stk	3 1/2%	Do. 3 1/2% Deb. Stk., Red.	100	99—101
\$689,593	Stk	4%	Do. 4% do. do.	100	102 1/2—104 1/2
179,318	1	8 1/2d.	Oriental Telephone & Elec. Co., Ltd.	1	1 1/2—1 3/4
50,000	1	7 1/2d.	Do. 6% Cum. Pref.	1	1 1/2—1 3/4
\$100,000	100	4%	Pacific & European Tel. 4% Guar. Debs. Red.	100	97—100
11,839	8	4/-	Reuter's Telegram Co., Ltd., ..	8	7 1/2—8
53,000	5	3/8	United River Plate Tel. Co., Ltd.	5	6 1/2—7 1/2*
40,000	5	2 1/8	Do. 5% Cum. Pref.	5	5—5 1/2
\$179,947	Stk	5/-	Do. 5% Deb. Stock, Red.	100	106—108
15,609	10	5/-	W. African Telegraph Co., Ltd., ..	10	8 1/2—9
\$30,038	2 1/2	—	West Coast of America, Ltd.	2 1/2	2 1/2—3 1/2
150,000	100	4%	Do. 4% Deb. Guar. by West. Tel.	100	99—101

TELEGRAPHS AND TELEPHONES.—Contd.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
88,321	10	6d.	W. India & Panama Tele. Co., Ltd., Or.	10	3—3 1/2
84,568	10	6/-	Do. 6% Cum. 1st Pref.	10	4—4 1/2
4,669	10	6/-	Do. 6% Cum. 2nd Pref.	10	5 1/2—6 1/2
\$20,000	100	5%	Do. 5% Deb.	100	101—104
207,930	10	3/-	Western Telegraph Co., Ltd.	10	13 1/2—14
\$75,000	100	5%	Do. 5% Debs., 2nd Series, 1906	100	100—102
518,945	Stk	4%	Do. 4% Deb. Stock, Red.	100	101—103

VI.—SHIPPING COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
32,500	10	5/8	Anchor Line (Henderson Bros.), Ltd., 5 1/2% Cum. Pref.	10	82—9
\$325,000	Stk	4 1/2%	Do. 4 1/2% Red. 1st Mort. Deb. Stk.	100	99—101
\$672,900	Stk	4 1/2%	British & African S. Nav. (1900) Ltd., 4 1/2% 1st Mort. Deb. Stk., Red.	100	95—97
10,000	10	5/8	Bucknall Steamship Lines, Ltd., 5 1/2% Cum. Pref.	10	5 1/2—6 1/2
\$600,000	Stk	4 1/2%	Do. 4 1/2% 1st Mort. Deb. Stk.	100	97—91
\$750,000	Stk	4 1/2%	Clan Line Steamers, Ltd., 4 1/2% Deb. Stk. Red.	100	99—101
60,000	20	16/-	Cunard Steam Ship Co., Ltd., ..	20	12—12 1/2
40,000	20	8/-	Do. Nos. 60,001—100,000	10	4 1/2—5 1/2
\$464,480	Stk	4 1/2%	Elder Dempster Shipping, Ltd., 4 1/2% 1st Mort. Deb. Stk.	100	100—102
1,200,000	1	6d.	Furness, Withy & Co., Ltd., Ord.	1	13—1 1/2
25,328	7 1/2	4/7	Gen. Steam Navigation Co., Ltd., Ord.	7 1/2	6—5 1/2
36,758	8	4 1/2%	Do. Non-Cum. 6% Pref.	8	7 1/2—8 1/2
\$150,000	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red.	100	98—100*
55,000	5	1 1/8	Houlder Line, Ltd., Ord.	5	2 1/2—2 3/4
40,000	5	2/9	Do. 5 1/2% Cum. Pref.	5	2 1/2—2 3/4
\$200,000	Stk	4 1/2%	Do. 4 1/2% 1st Mt. Deb. Stk. Red.	100	86—88
141,500	10	5/-	Leyland (Fredk.), & Co. (1900) Ltd., 5% Cum. Pref.	10	4—4 1/2
\$1,160,000	Stk	5%	Peninsular and Oriental Steam Nav. Co., 5% Cum. Pref.	100	128—131
\$1,160,000	Stk	19%	Do. do. Deferrad	100	223—226
15,000	100	30/-	Royal Mail Steam Packet Co. Ord.	60	84 1/2—85 1/2
89,075	5	2 1/8	Shaw, Savill & Albion, Ltd., 5% Cum. "A" Pref.	5	4 1/2—5 1/2
39,075	5	2 1/8	Do. "B" Ord.	5	4—4 1/2
141,841	10	4/-	Union Castle Mail Steamship Co., Ltd., Ord.	10	8 1/2—8 3/4
24,000	10	4 1/8	Do. 4 1/2% Cum. Pref.	10	10 1/2—10 3/4
\$1,008,894	Stk	4%	Do. 4% Debenture Stk., Red.	100	101—103*

VII.—MISCELLANEOUS COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
60,000	1	9 1/2d.	Chadburn's (Ship) Tele. Ltd., Ord.	1	1 1/2—1 1/4
\$750,000	Stk	9%	General Hydraulic Power Co., Ltd.	100	128—133
12,500	10	10/-	Oakey (John) and Sons, Ltd., Ord.	10	24—26
10,000	10	6/-	Do. do. 6% Cum. Pr.	10	14—15
183,538	1	6 1/2d.	Power Gas Corp., Ltd., Ord., Nos. 66,469—250	15/-	1 1/2—1 3/4
66,462	1	8 1/2d.	Do. do. Nos. 1, 66,462	1	1 1/2—1 3/4
135,000	1	6d.	Waygood (R.) & Co., Ltd., Ord.	1	1 1/2—1 3/4
135,000	1	7 1/2d.	Do. 6% Cum. Pref.	1	1 1/2—1 3/4

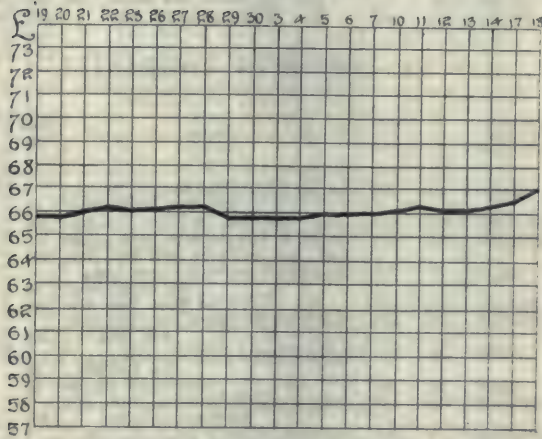
RAILWAY CARRIAGE & WAGON COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
10,000	10	7 1/8	Birm. Railway-Car. & Wagon, L., ..	10	28—23 1/2
8,739	10	9/-	Do. Second Issue 1-8,739	4	8 1/2—9 1/2
10,000	10	6/-	Do. Cum. Pref. 6% 1-10,000	10	13 1/2—14 1/2
30,111	7	7/-	Gloucester Rail.-Car & Wagon, Ltd., A, 1-29,861 & 49,751—50,000	7	9 1/2—9 3/4
44,889	7	3 1/8	Do. B, 29,862—49,750, 50,001—75,000	7	4 1/2—4 3/4
14,567	10	1 1/8	Lancashire Wagon, Ord.	2	2 1/2—2 3/4
4,150	10	5%	Do. do.	10	10 1/2—10 3/4
781,908	1	9d.	Metropolitan Amalgamated Rail.-Carriage & Wagon, Ltd., 1-784,808	1	41 1/2—41 1/4
164,288	1	6d.	Do. Cum. A Pref. 6% 1-164,288	1	23 1/2—24 1/2
235,000	1	7 1/2d.	Do. Cum. B Pref. 6% 1-235,000	1	27 1/2—28 1/2
20,000	20	20/-	Midland Rail.-Car. & Wagon, Ltd., 1-20,000	10	19—19 1/2

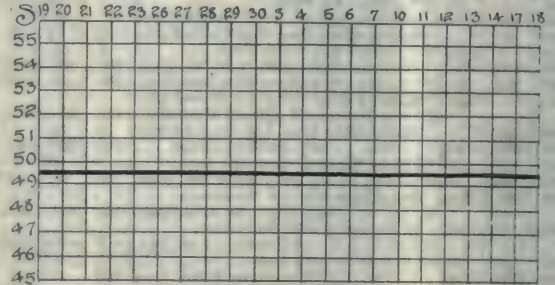
THE HOME METAL MARKET.

SHOWING DAILY FLUCTUATIONS FROM JUNE 19TH TO JULY 18TH, 1905.

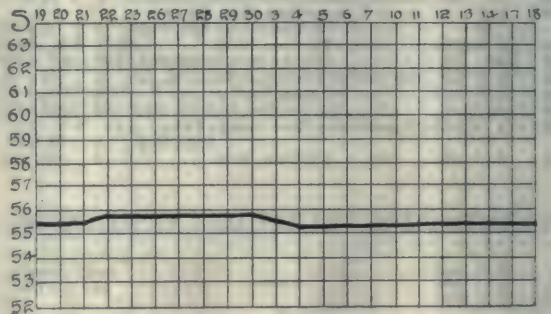
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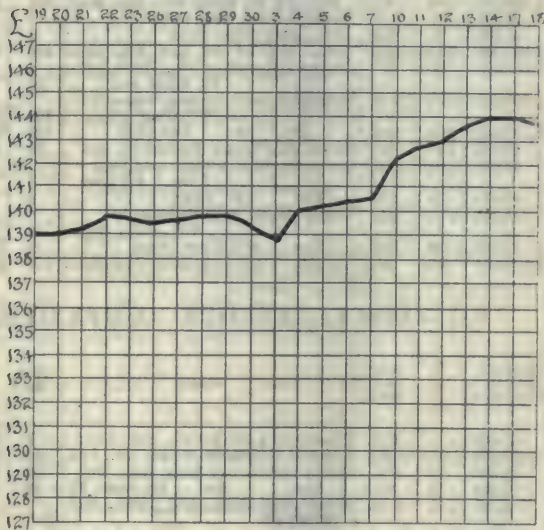
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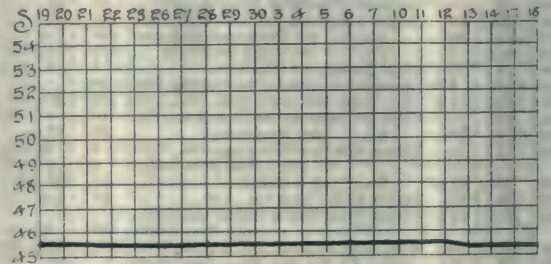
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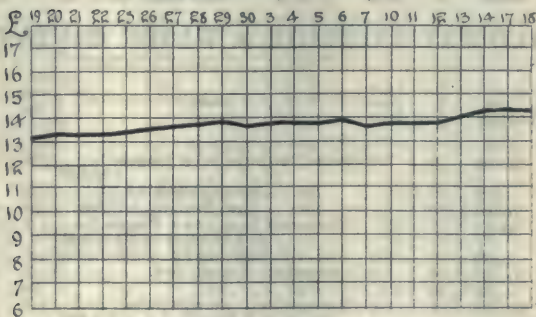
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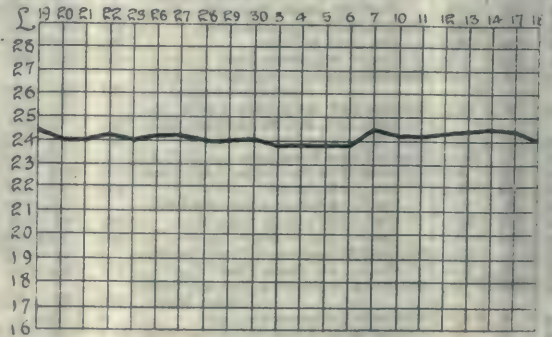
CLEVELAND.



ENGLISH LEAD.



SPELTER.



PRICES CURRENT OF COAL, IRON, STEEL, AND OTHER METALS.

MANUFACTURERS' AND MERCHANTS' QUOTATIONS.

MARKET REPORT.

Wednesday, July 19th, 1905.

THE Copper Market remains firm, good American advices and the rise in Copper shares exercising a favourable influence, while the strength of the Tin Market has not been without effect. A satisfactory feature is that the improved move in the market is largely based on a trading demand, so that the speculative position is a healthy one, with no sign of aggressive tactics on the part of either bulls or bears. In an attempt to estimate the future of the Copper Market regard must be paid to the increasing production in the States, and while there is little doubt that producers are likely to maintain prices for some little time to come there are a good many factors to be taken into account in framing a prophecy. A feature of the present position is the comparative scarcity of refined qualities. The market closed firm yesterday at £66 13s. 9d. cash and £65 18s. 9d. three months.

The strength of Tin continues, cash metal having risen to £144, but closed lower at £143 12s. 6d. Eastern advices have been very favourable and the large consumptive demand reported from the States coinciding with a strong statistical position explains the upward trend of the market.

Lead has again improved, as high as £13 17s. 6d. having been paid for prompt metal. Supplies have been coming to hand rather slowly, and dealers have found themselves in a somewhat critical position. The requirements of the trade have evidently been underestimated, and the statistics predict a further rise in in the price of the metal. The closing quotation is Foreign, £13 15s. and English, £14.

A fresh rise in the quotation for Spelter has to be noted, final quotations being £24 7s. 6d. ordinary and £24 12s. 6d. specials. There is an evident tightness for early delivery, and on a continuance of purchases for consumption, the bears have deemed it wise to begin covering operations.

There is little of interest to record in connection with the iron and steel market. The price of Middlesboro' having fluctuated only within narrow limits, the latest quotation being 45s. 5d. cash, with Standard at 43s. 10½d. The situation in the States is rather unsettled, and prices for pig iron are quoted lower, but the outlook is believed to be satisfactory and a recovery in quotations is imminent.

IRON, STEEL, PIG- IRON, &c.

SCOTLAND.

Messrs. David Colville and Sons, Ltd., Dalzell Steel and Iron Works, Motherwell, N.B., quote as follows. Prices delivered in Glasgow or equal:—




Steel:		£	s.	d.
DALZELL	Siemens' Steel Plates, Marine Boiler Quality	6	15	0
STEEL	" " " Land " "	6	17	6
STEEL	" " Steel Bars, Boiler Quality	6	17	6
DALZELL	Siemens' Steel Plates, Ship Quality Plates	5	17	6
STEEL	" " Bars " "	6	7	6
STEEL	" " Angles	5	7	6

Manufactured Iron:

Bars—Dalzell	6	2	6
" Best	6	12	6
" Horseshoe	6	12	6
" Angle	6	2	6
" Best Angle	6	12	6
" Best Best	7	2	6
" Extra Best	7	12	6

Usual terms and extras. Special rates for delivery in England and export. The above prices subject to alteration without notice.

The Glasgow Iron and Steel Co., Ltd., Wishaw, quote as under (prices are delivered Glasgow or equal):—

(Glasgow  Steel)	£	s.	d.	
Steel Angles	5	7	6	per ton.
Steel Ship Plates	5	17	6	"
Steel Bars, Ship Quality	6	7	6	"
Glasgow   Steel.				
Steel Bars, Boiler Quality	6	17	6	"
Steel Land Boiler Plates	6	7	6	"
Steel Marine Boiler Plates	6	7	6	"

Less 5 per cent. discount. Extras as per standard list.

Special prices for delivery in England and for export. The above prices subject to alteration without notice.

John Spencer (Coatbridge), Ltd., Phoenix Iron-works, Coatbridge, N.B., quote:—

Bars—Phoenix	£	s.	d.
" Best	6	5	0
" Best Best	6	15	0
" Best Best	7	5	0
" Extra Best	7	15	0
" Best Horse Shoe	6	15	0
" Extra B.H.S.	7	15	0
" Extra Best Cable	8	5	0
" Rivet	6	5	0
" Best Scrap Rivet	7	5	0

Angles—Phoenix	£ s. d.
Best	6 5 0
Extra Best	7 5 0
Gas Tube Hoops—Phoenix Best	6 15 0
Plates—Phoenix	
Best Boiler	7 10 0
Best Best Boiler	8 0 0
Extra Best Boiler	9 0 0
Boiler Tube Strips—Phoenix Best Best	8 0 0

All per ton, delivered f.a.s., Glasgow, Greenock, Grangemouth, Granton, Leith, or Ardrossan. 5 per cent. discount cash monthly.

Messrs. R. Feldtmann and Co., of Glasgow, quote Commission extra).

Pig Iron:	No. 1.	No. 3.
	£ s. d.	£ s. d.
Coltness, f.a.s. Glasgow.....	3 5 0	2 13 0
Gartsherrie.....	2 17 0	2 12 0
Summerlee.....	2 17 0	2 12 0
Carnbroe	2 14 0	2 12 0
Langloan	3 0 0	2 15 0
Calder.....	2 17 6	—
Clyde	2 16 6	2 11 6
Glengarnock, f.o.b. Ardrossan..	2 17 0	2 12 0
Eglinton	2 12 6	2 10 0
Dalmellington, „ Ayr	—	2 12 0
Shotts	2 17 6	2 12 6

NORTH OF ENGLAND.





Messrs. W. Whitwell and Co., Ltd., Thornaby Ironworks, Stockton, quote as follows, at works:—

	£ s. d.
W.W.  Bars	6 12 6
W.W. Best Bars	7 2 6
W.W. Best Best	7 12 6
W.W. Best Best Best	8 2 6
W.W. Best Shoe	7 2 6
Thornaby 	8 2 6
Thornaby Best.....	8 12 6
Thornaby Best Best	9 12 6
Whitwell Special Admiralty Cable	10 5 0
Special Chain Iron	9 5 0
Tube and Nail Strips	6 15 0
W.W.  Angle Iron	6 15 0
W.W. Best Angle Iron	7 5 0
Tee Iron, to 8-inches United.....	7 12 6

Terms, Cash, less 2½ per cent. discount on 10th of month following delivery.

LANCASHIRE.

The Pearson and Knowles Coal and Iron Company, Ltd. Dallam and Bewsey Forges, Warrington, quote:—

	Iron.	Steel.
	£ s. d.	£ s. d.
 Bars	6 10 0	6 15 0
 Angles	7 0 0	7 5 0
 Tees	7 10 0	7 15 0
 Hoops	7 0 0	7 10 0
W.I.W. Sheets	7 10 0	8 0 0

Ordinary Sizes, F.A.S. Liverpool in 10-ton Lots.

Extras for Sizes and Cutting as per List.

WORCESTERSHIRE.

Baldwins Ltd. (with which is amalgamated Knight and Crowther, Ltd.), Wilden Works, near Stourport, quote:—

	Singles 20 G 96in. by 36in. per ton.	Doubles 21 G to 24 G 96in. by 36in. per ton.
	£ s. d.	£ s. d.
Black Sheets		
“Vale”	10 0 0	10 10 0
“Shield”	10 10 0	11 10 0
“Severn”	11 10 0	12 10 0
“Baldwin Wilden B.”	12 10 0	13 10 0
Charcoal.....	16 10 0	17 10 0
Best Charcoal	18 10 0	19 10 0

Pickled, cold-rolled and close annealed sheets specially quoted for.

Extra widths, Singles to 66in., Doubles to 56in., Lattens to 46in. Extra lengths, Singles to 168in., Doubles to 132in., Lattens to 108in.

Patent Coated Sheets:

	£ s. d.	£ s. d.
No. 3 Lead.....	13 10 0	14 10 0
S.V. Lead	15 0 0	16 0 0
No. 3 Terne	15 0 0	16 0 0
S.V. Terne.....	16 10 0	17 10 0

Tinned Sheets:

	£ s. d.	£ s. d.
Best Coke (Finish)	29 0 0	30 10 0
Charcoal (Finish)	31 0 0	32 10 0
Extra „	33 0 0	34 10 0

Cotton Can Tin Sheets to 39in. by 36in. specially quoted for. Tin Plates, “Cookley, K” Best Charcoal, £1 7s. 0d. per box. Extreme sizes in Tin and Patent Coated specially quoted for. Lattens up to 36 wide by 27 W.G. £1 10s. 0d. per ton extra throughout for all brands. At works.

Galvanized Corrugated Sheets:

	£ s. d.
“Phoenix” Brand, 24 G., f.o.b. London, in Bundles	11 15 0 per ton.
“Blackwall” Brand, 26 G., in felt-lined cases for Australia, f.o.b. London.....	14 5 0 „

Galvanized Working Up-Sheets:

	£ s. d.
24 G., f.o.b. London, in Bundles	13 0 0 per ton.

STAFFORDSHIRE:

Shelton Iron, Steel, and Coal Co., Ltd., Stoke-on-Trent, North Staffordshire, and 122, Cannon Street, London, quote:—

	£ s. d.
Crown Bars.....	6 10 0 per ton.
Best Bars (1 to 6in. wide, above ½ in. thick, ½ in. to 4 rounds and squares)	7 0 0 „
Angles	6 15 0 „
„ Best	7 5 0 „
T's	7 0 0 „
„ Best	7 10 0 „
Best Shoe Iron	8 0 0 „
„ Rivet Iron	8 0 0 „
„ Best Rivet (Special)	9 5 0 „
„ Cable	9 5 0 „
„ Screwing.....	5 5 0 „

	£	s.	d.	
Best Turning	8	0	0	per ton.
„ Plating	8	5	0	„
Best Best	9	5	0	„
Treble Best	10	5	0	„
Plates	7	10	0	„
Best Plates	8	0	0	„
„ Boiler Plates	8	10	0	„
„ Best Boiler Plates	9	10	0	„
Treble Best Boiler Plates	12	0	0	„

Delivery f.o.b. Liverpool, Birkenhead or Manchester.

WALES.

Cordes (Dos Works), Ltd., of Newport, Mon.,
quote 'Star' brand patent wrought nails steel nails, &c.

Discounts—

45 per cent. off 1-inch to 3-inch strong rose and all fine rose and 8dy. and 8dy. pound.

40 per cent. off 3½ inch to 7-inch strong rose and 10dy. and 20dy. pound.

40 per cent. off all sharp-pointed nails.
Delivered in lots of 4 cwt. and upwards. Extra 2½ per cent. discount off the gross on two tons and upwards.

Steel rose, flat points, 5-inch to 7-inch basis:—
2 tons 9/6 per cwt. } d/d any Railway Station.
4 cwt. lots and upwards 9/9 per cwt. }

Steel cut nails, 3-inch basis—
2 tons 8/3 per cwt. } d/d any Railway Station.
4 cwt. lots 8/6 per cwt. }

Slit rods (iron) £7 10s. per ton, at works for 2-ton lots.

Messrs. Richard Thomas and Co., Ltd., of
33 and 35, Eastcheap, E. C. — Works: South
Wales, Burry, Lydney, Lydbrook, and Cwmbwrla,
quote:—

Per Box.
f.o.b.
Wales.

Coke Tin-plates.	£	s.	d.
C 18½ by 14 124s. 110 lb. "BV"	0	12	0
C 20 by 10 225s. 155 „ "Jumbo"	0	17	0
C 20 by 14 112s. 108 „ "Lydbrook"	0	11	9
C 28 by 20 112s. 216 „ "Lydbrook"	1	3	9

Charcoal Tinplates:

C 20 by 14 112s. 108 lb. "Allaway"

BELGIUM.

C. L. Faulkner, Suffolk House, Laurence
Pountney Hill, London, E.C., quotes:—

Prices quoted are in £ stg. and per ton of 1,015 kos. (2,240 lb.) delivered free on board ANTWERP for approved quantities.

Steel:	£	s.	d.
Blooms	at 3	16	0 per ton.
Billets	at 3	18	0 „
Sheet Bars	at 4	0	0 „

Finished Steel:

Bars	at 4	19	0 per ton.
Angles	at 5	0	0 „
Tees	at 5	3	0 „
Joists	at 4	10	0 „
Fencing Standards	at 5	2	0 „
Shoeing Bars	at 5	5	0 „
Tyre Bars	at 5	5	0 „
Half-Round Bars	at 5	10	0 „
Heavy Rails	at 5	5	0 „
Light Rails	at 4	17	6 „

Structural Steelwork:

Prices on application.

METALS.

Messrs. French and Smith, 147, Leadenhall
Street, and 11, Oldhall Street, Liverpool, quote:—

TIN.

Tin:	£	s.	d.	£	s.	d.
English Ingots, f.o.b.	143	10	0 to 144	0	0	0 per ton
Dis. 1¼% & 1%	143	10	0 to 144	0	0	0 „
English Bars, f.o.b.	144	10	0 to 145	0	0	0 „
Dis. 1¼% & 1%	144	10	0 to 145	0	0	0 „
Straits G.M.B., cash	143	10	0 to 143	12	6	0 „
Warehouse, Net	143	10	0 to 143	12	6	0 „
Straits G.M.B., 3 months, Warehouse, Net	142	10	0 to 142	12	6	0 „
Australian, Mt. Bischoff, Warehouse, Net	145	10	0 to 146	0	0	0 „

COPPER

Copper:	£	s.	d.	£	s.	d.
Standard G.M.B., cash	66	15	0 to 66	17	6	0 per ton.
Warehouse, Net	67	0	0 to 67	2	6	0 „
Standard G.M.B., 3 months, Warehouse, Net	70	0	0 to 70	10	0	0 „
English, Tough, Cake & Ingot, Warehouses, Net	71	0	0 to 71	5	0	0 „
English, Best Select, Warehouse Net	79	0	0 to 80	0	0	0 „
English, Sheets and Sheathing, f.o.b., Dis. 2¼%	75	0	0 to 76	0	0	0 „
English, Sheets for India, f.o.b., Dis. 2¼%	70	0	0 to 70	10	0	0 „
Electro, Warehouse, Net	0	11	9 to 0	12	9	0 per unit
Ore, ex ship	0	13	0 to 0	13	6	0 „
Regulus, Matte and Precipitate, ex ship,	0	13	0 to 0	13	6	0 „

YELLOW METAL.

Yellow Metal:

	£	s.	d.
Sheets, 4 by 4 feet for	0	0	6½ per lb.
India f.o.b. Dis. 2¼%	0	0	6½ „
Sheathing „ „	0	0	6½ „

SPELTER.

	£	s.	d.	£	s.	d.
Silesian outports, Net	24	7	6 to 24	10	0	0 per ton.
Blende of 50% Net	6	12	6 to 6	13	6	0 „
Calamine, Net	6	15	0 to 6	16	0	0 „

LEAD.

	£	s.	d.	£	s.	d.
English Pig, Warehouse, Dis. 2¼%	14	0	0 to 14	5	0	0 per ton.
Spanish, ex ship, Dis. 2¼%	13	15	0 to 14	0	0	0 „
Lead Ore of 70%, Net	6	14	6	—	—	—

ANTIMONY.

	£	s.	d.	£	s.	d.
Star Regulus, f.o.b., Dis. 2¼%	60	0	0 to 61	0	0	0 per ton.
Ore, 50%, ex ship, Dis. 2¼%	16	0	0 to 16	10	0	0 „
Crude, ex ship, Dis. 2¼%	35	0	0 to 37	0	0	0 „

QUICKSILVER.

	£	s.	d.
Spanish, 75 lb., Warehouse, Net	7	7	6 per flask
Italian „ „ „	7	5	6 „

COAL.**LEICESTERSHIRE.**

The Nailstone Colliery Company, Leicester,
quote. Price per Ton at Pit of 20 Cwt., with $\frac{1}{2}$ Cwt. per
Ton for wastage —

Upper Main Seam.	s. d.
Main Coal	6 0
Best Hard Steam (hand picked, as used by the Railway Companies)	5 6
Best Hard Steam Cobbles (made through 6 in. mesh, free from slack)	5 6
Fine Slack	0 6

Terms, net cash on 10th of month following delivery.

DERBYSHIRE.

The Manners Colliery Co., Ltd., of Ilkeston
quote as follows, per ton at pit:

Kilburn Coal:	s. d.
Best London Brights	9 9
Large Nuts ($1\frac{1}{2}$ to $3\frac{1}{2}$)	9 6
Small Nuts ($\frac{3}{4}$ to $1\frac{1}{2}$)	6 0
Rough Brights	6 0
Peas ($\frac{3}{4}$ to $\frac{1}{2}$)	5 0
Slack	3 6
Smudge	2 0

Low Main (or Tupton) Coal:

Low Main Brights	7 6
" " Nuts	7 3
Hards (Good Steam Coal)	8 0
Bakers' Nuts (1" to 2")	6 6
Slack	3 6

The Clay Cross Company's Collieries, Clay Cross,
near Chesterfield, quote:—

	per ton at pit.
Best Main Coal	10 6
Best Silkstone	10 0
Best House Coal	8 6
Best House Nuts	8 0
Treble Screened Cobbles	7 9
Best Cobbles	7 3

NOTTINGHAMSHIRE.

The Digby Colliery Co., Ltd., near Nottingham,
quote per ton at pit:—

Digby Coal:

STEAM.	s. d.
Best Hand Picked Hard	8 6
Steam Hard	7 3
Hard Nuts	6 6

Gedling Colliery.**HIGH HAZEL.**

London Brights, 4 to 8 in. cube	9 6
Bright Cobbles (Hand Picked)	9 0
Large Nuts, 2 to 4 in. cube	8 0
Small Nuts, 1 to 2 in. cube	6 0
Pea Nuts, $\frac{3}{4}$ to 1 in. cube	5 0

STEAM.—TOP HARD.

Best Hard	8 6
Hard Steam	7 6
Cobbles	6 3

CHEMICALS.

Messrs. S. W. Royse and Co., Albert Square,
Manchester, quote:

Acids:	£ s. d.
Oxalic	0 0 2 $\frac{1}{2}$ per lb.
Picric, Crystals	0 0 10 "
Tartaric	0 0 10 $\frac{1}{2}$ "

Acetate of Lime:	£ s. d.
Brown at Manchester net	8 10 0 per ton
Grey	11 12 6 "
Alumina: Alum, Lump, loose	5 5 0 "
" " in casks	5 7 6 "
" " Ground, in bags	5 15 0 "
Sulphate of Alumina, 14%	4 10 0 "

Ammonia: Carbonate	0 0 3 $\frac{1}{2}$ per lb.
Muriate Grey f.o.b. Liverpool	23 15 0 per ton.
Sal-ammoniac, Lump, 1sts, del'd. U.K.	42 0 0 "
" " 2nds, "	40 0 0 "
Sulphate	f.o.b. Liverpool 12 10 0 "
Arsenic: Best White Powdered	12 6 0 "
Bleaching Powder, 35%	4 10 0 "
Borax: British Refined Crystal	12 0 0 "

Coal Tar Products:

Benzole, 50, 90 %	0 0 6 per gal.
" " 90%	0 0 7 "
Carbolic Acid Crystals, 34 35° C.	0 0 6 $\frac{1}{2}$ per lb.
" " 39/40° C.	0 0 6 $\frac{1}{2}$ "
" " Liquid, 97.99 %	0 0 9 per gal.
" " Crude, 62 $\frac{1}{2}$ % at 60° F.	f.o.b. 0 1 9 "
Creosote, ordinary good liquid	0 0 1 $\frac{1}{2}$ "
Naphtha, Crude, 20 % at 120° C.	0 0 3 "
" " Solvent, 90 % at 160° C. f.o.b.	0 0 8 "
" " 95 % at 160° C. "	0 0 9 "
" " 90 % at 190° C. "	0 0 10 "
" " Rectified, flash point over 73° F.	f.o.b. 0 0 11 "
" " Rectified, flash point over 100° F.	f.o.b. 0 1 0 "

Naphthalene, all qualities.	
Pitch	f.a.s. Manchester. 1 7 6 per ton.

Copperas: Green, in bulk	0 12 6 "
" " barrels f.o.b. L'pool	1 17 6 "
" " Cake	1 2 6 "
Copper: Sulphate	20 0 0 "

Cyanides: 98% minimum	f.o.b. net 0 0 7 $\frac{1}{2}$ per lb.
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Lead: Acetate (Sugar) White, English	27 10 0 per ton.
" " " Foreign c.i.f. U.K.	23 5 0 "
" " " Grey	21 15 0 "
" " " Brown at Manchester	16 15 0 "
Nitrate	24 10 0 "
Litharge, Flake	15 10 0 "
" " Powder	16 0 0 "
Red Lead, Genuine, c.i.f. London	less 5% 15 10 0 "
White " " Dry "	16 15 0 "

Naphtha (Wood): Miscible, 60 o.p.	0 2 6 per gal.
Solvent	0 2 7 "

Potash: Bichromate... delivered England	0 0 3 per lb.
Carbonate, 90/92 %	c.i.f. Hull 18 5 0 per ton.
Caustic, 75/80 %	" " 20 10 0 "
Chlorate	net 0 0 3 $\frac{1}{2}$ per lb.
Montreal	in Store, Liverpool 32 0 0 per ton.
Prussiate, Yellow	net 0 0 4 $\frac{1}{2}$ per lb.

	£	s.	d.	
Soda: Ash, Caustic, 48 %, Ordinary ... net	5	5	0	per ton.
" " " " Refined.....	6	5	0	"
" Carbonated, 48 %.....	5	10	0	"
" " " " 58 % (Ammonia Alkali).....net	4	10	0	"
" Bleachers' Refined Caustic 50/52 %	6	10	0	"
Caustic, White, 77 %.....	10	12	6	"
" " " " 70 %.....	9	12	6	"
" " " " 60 %.....	8	12	6	"
" Cream, 60 %.....	8	10	0	"
Crystals, in bags	3	0	0	"
" " barrels	3	7	6	"
Acetate	16	12	6	"
Bicarbonate, in 1 cwt. kegs.....	6	15	0	"
Bichromate.....delivered England..	0	0	2½	per lb.
Chlorate	0	0	3½	per lb.
Nitrate .ex quay Liverpool,	11	2	6	per ton.
Phosphate	9	5	0	"
Prussiate	0	0	3½	per lb.
Silicate, Solution, 140° Tw.	4	10	0	per ton.
Sulphate (Glauber Salts).....	1	12	6	"
" (Saltcake, 95%).....	1	15	0	"
Sulphur: Recovered	4	15	0	"
Roll	6	15	0	"
Flowers.....	7	10	0	"
Zinc: Sulphate	6	15	0	"
Shellac: Standard TN orange spot	7	10	0	per cwt.

MINERALS.

Messrs. S. W. Royse and Co., quote:—

	£	s.	d.	
Barytes: Lump Carbonate, 90/92%	3	10	0	per ton.
Sulphate, No. 1, White	2	15	0	"
China Clay: of various qualities for all purposes; prices from about 11/- to about 30/- per ton, f.o.b. Cornwall: stocks also kept at Buncorn and Preston. Quotations given carriage paid.				
Chrome Ore: Basis 50% c.i.f. British Ports.....	5	10	0	"
Manganese: Lump c.i.f. Liverpool 10½d. per metallic unit.				
Ochre: French JC	2	5	0	per ton.
" " " " JF	5	10	0	"
Talc: (French Chalk).....c.i.f. Liverpool	3	10	0	"

Messrs. Henry Bath and Son, quote:—

	£	s.	d.	
Copper, Ores of, 10 to 25%	0	12	0	to 0 13 0 per unit.
Regulus, 45 to 55%	0	13	3	to 0 13 9 "
Precipitate, 65 to 80% ...	0	13	4½	to 0 13 10½ "
Tin Ores, 70 %.....	91	0	0	to 93 0 0 per ton.
Lead Ore, 70%	6	19	0	"
Blende, 50%	6	9	8	"
Calamine.....	6	12	0	"
Antimony Ore, 50%.....	20	0	0	to 22 0 0 , nom.

Messrs. Barrington and Holt, Cartagena, quote:—

Iron Ore.

	s.	d.	
Ord. 50%,f.o.b. Porman	6	4	per ton.
Do. Cartagena	6	7	"
Special low phos, .. Porman	6	10	"
Do. Cartagena.....	7	0	"
Extra quality do.	7	8	"
Special Iron Ore			nominal
Specular 58% do.	9	6	"

TIMBER.

Messrs. Alfred Dobell and Co., Liverpool, quote:—

COLONIAL WOODS.

Timber.

	£	s.	d.		£	s.	d.
Quebec Square White Pine... per cub. ft.	0	1	9	to	0	3	3
Quebec Waney Board Pine...	0	2	8		0	3	9
St. John Pine, 18 in. average ..	0	2	4		0	3	3
Lower Ports Pine.....	0	1	3		0	1	8
Quebec Red Pine	0	1	6		0	2	3
Quebec Oak, 1st quality	0	2	3		0	3	4
Quebec Oak, 2nd quality ..	0	1	6		0	2	6
Ash	0	1	6		0	2	3
Elm	0	3	3		0	4	0
Hickory	0	2	0		0	2	6
Quebec Birch	0	1	6		0	2	3
St. John Birch	0	1	6		0	2	0
Birch Planks	0	0	9		0	0	11
Spruce Spars	0	0	10		0	1	0

Deals.

1st quality Quebec Pine..... per std.	22	10	0	to	32	10	0
2nd do.	17	0	0		22	0	0
3rd do.	11	10	0		13	0	0
St. John, Miramichi, etc.,							
Spruce	7	2	6		7	7	6
Nova Scotia Spruce.....	7	0	0		7	5	0

Spruce Boards..... 6 7 6 6 12 6

UNITED STATES, etc., WOODS.

Pitch Pine.

	£	s.	d.		£	s.	d.
Hewn	0	1	4	to	0	1	8
Sawn	0	1	0		0	1	6
Planks, Stowage	0	0	10		0	1	0
Boards, Prime	12	10	0		16	0	0

Oak Timber per cub. ft. | 0 | 1 | 6 | 0 | 2 | 6 |

Oak Planks " | 0 | 1 | 6 | 0 | 2 | 1 |

East India Teak..... per load 12 0 0 16 0 0

Greenheart..... 6 15 0 7 10 0

EUROPEAN WOODS.

Timber.

	£	s.	d.	£	s.	d.		
Riga Redwood	per cub. ft.	0	1	6	to	0	2	0
Dantzic and Memel Fir, Crown	"	0	2	1	0	2	6	
Dantzic and Memel Fir, Middling	"	0	1	9	0	1	11	
Stettin	"	0	1	9	0	1	11	
Swedish	"	0	1	0	0	1	3	
Riga Whitewood	"	0	1	0	0	1	3	
Norway Mining Timber	"	0	0	9	0	1	0	
Dantzic and Stettin, etc., Oak	"	0	2	6	0	3	0	

Norway Spars..... 0 1 2 0 1 9

Deals.

Red Archangel and Onega, 1st quality	per std.	19	0	0	20	0	0
Red Archangel and Onega, 2nd quality	"	14	0	0	16	0	0
Red Archangel and Onega, 3rd quality	"	10	10	0	12	10	0
St. Petersburg, 1st quality..	"	16	0	0	17	10	0
Do. 2nd ..	"	14	0	0	15	0	0
Gefle	"	11	10	0	16	0	0
Wyburg	"	11	0	0	12	10	0
Uleaborg	"	10	0	0	12	10	0
Gothenburg	"	11	0	0	16	0	0

SELECTED PATENTS.

Compiled expressly for this journal by **Messrs. Page and Rowlingson, Engineering Patent Agents, 28, New Bridge Street, London, E.C.,** and at Manchester.

Copies of Specifications may be obtained at the Patent Office Sale Branch, 25, Southampton Buildings, Chancery Lane, W.C., at the uniform price of 8d.

NEW PATENTS APPLIED FOR.

When Patents have been communicated the names of the communicators are printed in *italics*.

13611. J. H. Dickson, Jun., Londonderry, July 3rd.—Improvements in prepayment attachment for gas meters.

13614. W. P. Gibbons, R. Masters, and G. A. Baeddicker, Birmingham, July 3rd.—Improvements in the construction of furnaces, muffles, and kilns.

13616. C. F. J. Barker, Clacton-on-Sea, July 3rd.—An improved means for steering bicycles by the knee, in addition to the hand.

13639. R. L. K. Hazell, Colchester, July 3rd.—Improvements in steam generators.

13646. J. A. Peer, London, July 3rd.—Improvements relating to mitring machines.

13648. C. Lee, Bedford, July 3rd.—Improvements in valves for pneumatic tyres.

13653. W. S. Shields and W. de Forest Jones, London, July 3rd.—Improvements relating to liquid controllers.

13656. H. E. Pain, London, July 3rd.—Improvements relating to variable speed gear.

13659. H. E. Newton, London, July 5th.—Improvements in folding machines. (*Robert Hoe, U.S.A.*)

13661. H. S. Wooley and H. Hubbard, London, July 3rd.—Improvements relating to steam furnaces.

13664. E. Fowell, Bromley, July 3rd.—Wind indicator.

13700. F. C. Weber, London, July 3rd.—Improvements in pumping apparatus.

13707. British Thomson-Houston Co., Ltd., London, July 3rd.—Improvements relating to dynamo electric machines. (*General Elec. Co., U.S.A.*)

13719. T. D. Hamilton, J. Rusk, and W. A. Robertson, Glasgow, July 4th.—Improvements in sewing machines.

13733. C. Pollard, Senr., and C. Pollard, Jun., and R. W. Pollard, Bingley, July 4th.—Exceed speed indicator for motor cars.

13737. A. W. Brightmore and R. W. H. Bailey, Egham, July 4th.—Improvements in steering gear for motor-driven vehicles.

13773. W. H. Nicholson, London, July 4th.—Improvements in shaft couplings.

13787. E. L. Warton, London, July 4th.—An improved automatic car coupling.

13816. F. Jenson, London, July 4th.—An electro-magnet reversing gear.

13818. G. Hume, London, July 5th.—An improved gas retarder.

13840. J. Murphy, Glasgow, July 5th.—Improvements connected with weighing machines and scales.

13842. H. N. Davidge, London, July 5th.—Improved trolley head for electric tramway cars.

13875. F. and G. and H. Makin, London, July 5th.—Improved brake for road vehicles.

13881. W. J. A. London, London, July 5th.—Improvements in elastic fluid turbines.

13893. O. Recke, Liverpool, July 5th.—Improvements in turbines.

13921. G. Black, Jun., Glasgow, July 6th.—Improvements in vertical multi-tubular boilers.

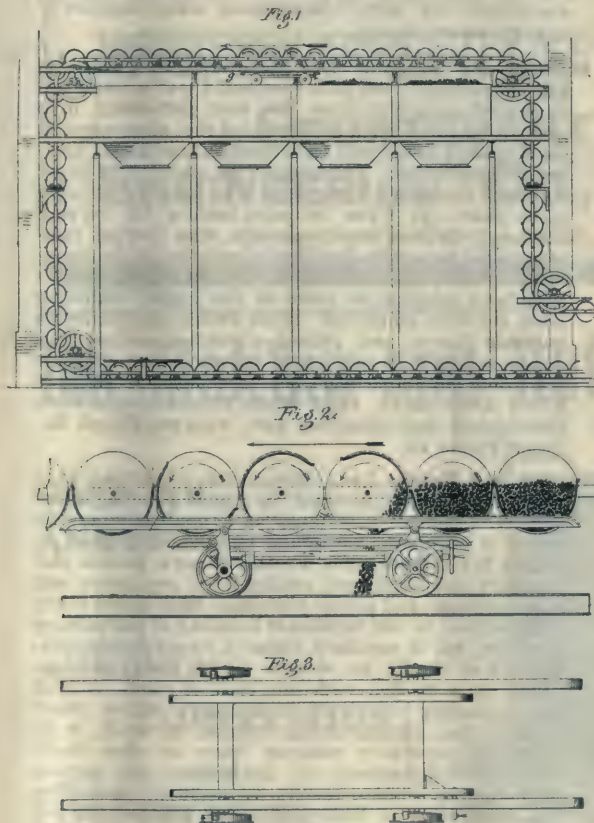
RECENT SPECIFICATIONS.

IMPROVEMENTS IN BUCKET CONVEYORS AND ELEVATORS FOR TRANSPORTING COAL, ASHES AND OTHER MATERIALS.

Messrs. R. Dempster and Sons, Ltd., and J. W. Broadhead, Elland.—This invention has reference more especially to that type of bucket conveyor and elevator in which the buckets are retained in a horizontal position by the force of gravity, the object of the improvements being to construct same to run more smoothly than those at present in use, and at the same time to ensure the delivery by the buckets of the whole of their load by completely inverting the buckets. The accompanying drawings show, by way of example, a mode of their application to a conveyor in which the buckets are carried by a chain travelling over stationary rollers. Fig. 1 is a general view of the conveyor and bunkers. Fig. 2 is a side elevation on a larger scale of the portion of the apparatus at which the contents of the buckets are discharged, with the buckets in section, and fig. 3 is a plan of the carriage shown in fig. 2. On the top of the bunkers are rails on which can travel a tipping carriage, adapted to cause the discharge of the contents of the buckets at any desired point, as these buckets are brought up full by the chain. The troughs or bodies of the buckets are preferably of a curved or semi-cylindrical form, corresponding with the shape of the circular ends of the buckets, each bucket having two projecting lips or flanges overlapping the lips of the two adjacent buckets, these lips stiffening the buckets and preventing the coal or other material from falling between the buckets when feeding the conveyor. The tipping carriage may be moved by hand, by positive driving mechanism or by a frictional drive obtained from the conveyor, as shown in figs. 2 and 3.

To obtain a forward movement of the carriage, the screw is caused to incline the levers backward so that the

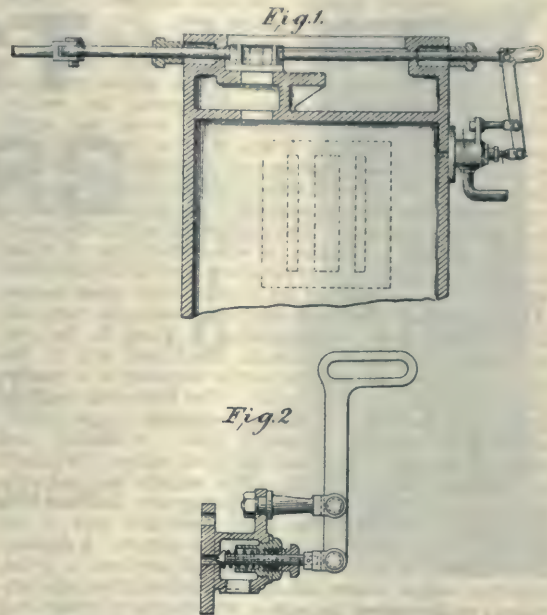
upper shoes are lowered out of contact with the rollers, when the weight of the buckets acting upon the lower shoes will carry the whole carriage forward along the rails. A further inclination of the lever brings the locking rollers to be gripped between the wheels and the rails on which the rollers are supported, thereby keeping the carriage stationary. By causing the screw to force the levers into a vertical position so that the upper shoes bear against the rollers, the tendency of the lower shoes to move forward is overpowered, and the carriage forced backwards. The carriage is brought on the rails over the bunker which is being filled, and the circular ends of the buckets passing over the lower shoes act in the manner of wheels, so that each bucket has made half a revolution by the time the chain has carried this bucket to the centre of the shoes, and the bucket being thus inverted discharges its contents into the bunker through the opening between the shoes and the axes. The revolution of the bucket is completed at a constant speed, without shock or jar, by the time the bucket passes off the other end of the shoes on its way to the drum, and the effect of this complete revolution is that the right-hand lip of each bucket, which was formerly above the lip of the next following bucket, is now below the said (left-hand) lip—this will be clearly seen in fig. 2. This reversal of the lips allows the buckets to pass freely over the drum, without the necessity of employing any additional tipping device. In passing the drum shown in left-hand bottom corner, the left-hand lips take a position under the lips of the adjacent



bucket, and the buckets then coming in contact with the bar, perform another complete revolution, thus again restoring the left-hand lips to their position above the right-hand lips ready for passing around the next drum (not shown.)

IMPROVEMENTS IN FLUID PRESSURE ENGINES.

Messrs. Clayton and Shuttleworth, Ltd., and W. Whinney, Lincoln, May 25th, 1905.—A traction or other engine working at high pressure and constructed as heretofore usually runs for a considerable



time after the stop valve has closed even when the cylinder cocks are open. This invention has for object, inter alia, to obviate the aforesaid disadvantage by simple means and without having recourse to the application of a brake. For this purpose, the steam chest or corresponding part of the engine is provided with a special outlet and the stop valve is adapted to control the exit of steam in such a manner that the outlet is opened and closed on the closing and opening respectively of the stop valve, so that immediately after the stop valve closes the steam chest is emptied of live steam and the engine stops. According to one construction the special outlet of the steam chest is provided with a valve, the casing of which is secured to the exterior of the chest, and the stem of the valve, which is provided with a spring for keeping it normally against its seat, is connected to one end of a lever the other end of which is provided with a slot and is connected by a pin engaging therein with the rod of a slide stop valve, so that when the stop valve closes the relief valve is opened by the action of the pin on the lever whilst when the stop valve opens the lever is liberated by the pin and the relief valve is allowed to be closed by its spring. A further advantage of the invention is that it tends to prevent the engine from stopping with the crank at a dead centre. It also facilitates the reversing of the engine since, as the steam chest is emptied of live steam on the stoppage of the engine previous to reversing, there is no pressure on the back of the distributing slide valve and it is not necessary to open the cylinder cocks. The invention facilitates the working of traction engines in cramped situations, on soft land, and wherever the engines meet with difficulty. An example of apparatus constructed in accordance with the invention is shown in figs. 1 and 2 of the drawings, fig. 1 showing the steam chest in section, and fig. 2 the casing of the relief valve also in section.

NEW PUBLICATIONS.

"HYDRAULIC POWER ENGINEERING."

A practical manual on the concentration and transmission of power by hydraulic machinery. By G. Croydon Marks. Second Edition. Crosby, Lockwood and Son. 10s. 6d. net.

The aim of this work, which may be regarded as a successor to the same author's previous volume on hydraulic machinery, is to describe the salient principles requiring attention by engineers having the responsibility of designing or constructing works and appliances for the utilisation of water for the transmission of power. A considerable amount of fresh data has been included in this new edition, embodying examples of recent developments connected with hydraulic pressing and lifting machinery. The work opens with a discussion of the general properties of water, the flow of water in reference to theoretical velocities, and the investigation of the losses occasioned by friction and other causes. The second part deals with hydraulic pressures, materials, and the test load; consideration is given to the constructional details of hydraulic machinery and in the chapter on the test load the author disposes of a number of fallacies in common belief. The following sections deal with packing for sliding surfaces; pipe joints; controlling valves; platform lifts; workshop and foundry cranes; warehouse and dock cranes; hydraulic accumulators and pumps. The section on hydraulic presses is well illustrated by photographs and working drawings. Probably the most important part of the work is that dealing with hydraulic motors. A detailed examination of the various types of turbines is given, and the author makes full use of mathematical elucidations; at the outset the action of a stream of water on a curved vane is discussed, after which are considered impulse turbines; reaction turbines; design of turbines in detail; water wheels and hydraulic engines, the work concluding with a summary of recent achievements. Although many new illustrations have been added, by a judicious condensation of the text, the writer has been enabled to keep the volume within a very convenient compass.

BOOKS RECEIVED.

"The Royal Navy List and Naval Recorder." A book of reference relating to the personnel of the navy, both active and retired, and the ships of the fleet; together with a narrative of contemporary naval events and a naval bibliography. (Wetherby and Co. 10s.) We have already called attention to this excellent compilation, the usefulness of which cannot be over estimated.—"Recent Advances in the Electro-Metallurgy of Iron and Steel." By R. S. Hutton. (Vacher and Sons.) An interesting paper reprinted from the journal of the Society of Chemical Industry.—"Card Indexing and Filing." By J. Charles Osborne. Reprinted from the Transactions of the Civil and Mechanical Engineers' Society.—"Practical Plumber's Work." Edited by Paul N. Hasluck. (Cassell and Co. 2s.) A handy illustrated volume containing concise information on the general principles and practice of plumbing.—"Builder's Quantities for Foundations, Windows, Doors, Floors, etc." With illustrations and examples. Edited by Paul N. Hasluck. (Cassell and Co. 6d.)—"A Course in Practical Mathematics." By F. M. Saxelby, M.Sc., B.A. (Longmans, Green and Co. 6s. 6d.)—"Minutes of Proceedings of the Engineering Association of New South Wales. Vol. XVIII. containing the president's address and a number of valuable papers read before the Association.

NEW CATALOGUES.

The London Electric Firm, George Street, Croydon. A useful little pamphlet on arc lamp lowering gear reaches us from this firm. The gear consists of an improved contact and suspension device, with only one working part, and an improved self-sustaining winch. It is claimed that the device saves its cost in trimming and overcomes the risk of accident.

J. G. Slater and Co., Birmingham, forward their latest lists of electrical appliances, motor-car and other accessories, including insulated box spanners; laminated chopper switches; automatic battery regulator; plain and quick-break knife switches; porcelain switch fuses; magnetic blow-out fuses; free handle circuit breakers, etc. Sheet No. 105 is concerned with motor-car accessories—more particularly jacks provided with gun-metal nuts.

Ashwell and Nesbit Ltd., Bedford Row, W.C., Leicester, etc., have issued a finely illustrated quarto booklet, with nearly forty prominent examples of their warming and ventilating apparatus as installed in public buildings. Prominence is given to the "Leicester Plenum System," but several others receive attention. We are reminded that the firm make a speciality of piping arrangements, cooking apparatus, laundry equipment, hot water installations, water supplies to country mansions, etc.

McPhail and Simpsons' Dry Steam Patents Company, Ltd., Wakefield. We have received a well printed and illustrated pamphlet from this firm, indicating, in a general way, the methods by which the advantages of superheating economies have been secured under varying circumstances. Incidentally we gather that in the course of the firm's experience they have constructed more than 150 types of superheaters for varying services. In their latest apparatus, with internal radiating pipes for controlling the temperature of the superheated steam, light steel pipes with extra strong flanges have been adopted in place of the copper radiating tubes formerly employed. This avoids the liability to galvanic action and pitting which experience has shown results from the use of copper pipes. We are reminded that the firm are also specialists in Multiple Effect Evaporators, Feed Water Heaters, Re-heaters, Interheaters, and Glycerine, Salt, Soda and Potash Recovery Plants, etc.

Holden and Brooke Ltd., Manchester. In these days when the "catalogue fiend" is abroad (i.e. the gentleman who collects catalogues as a hobby) it may be found of economic advantage to issue catalogues in brief. We do not know whether Messrs. Holden and Brooke's new abridged catalogue of appliances and steam fittings and power plants has been issued solely with a view to the economic handling of preliminary inquiries, but it certainly forms a handy pocket catalogue and should be written for by those who are called upon to deal with this class of plant. Among the apparatus described is Leinert's Water Meter (Patent), the distinguishing feature of which is its ability to accurately measure water or other liquid without re-adjustment or calculation for varying temperatures. These meters are useful for measuring the evaporation of boilers or water supplied for any other purpose. They may be used for any class of liquid and we understand are already largely in use in Russia for measuring petroleum. The catalogue comprises heaters, regulators, separators, traps, pumps, steam injectors, ejectors and water lifters, steam valves, heating systems, etc.

PAGE'S WEEKLY

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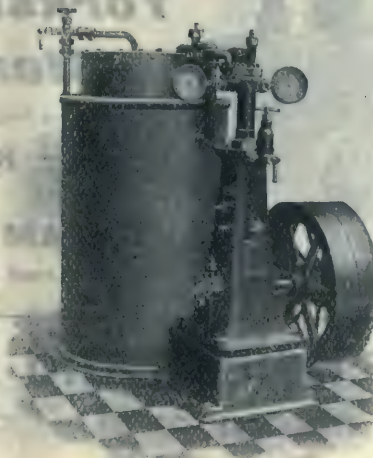
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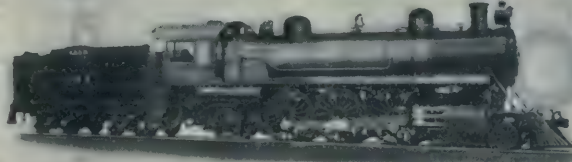
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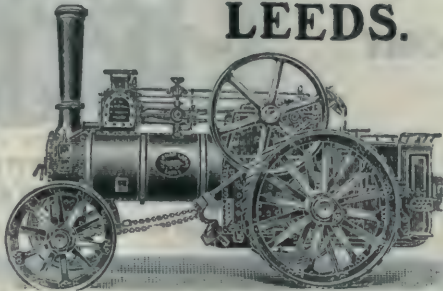
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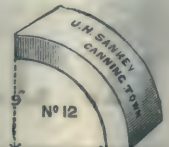
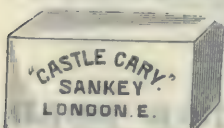
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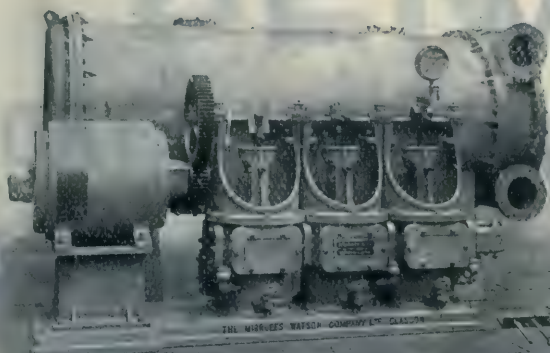


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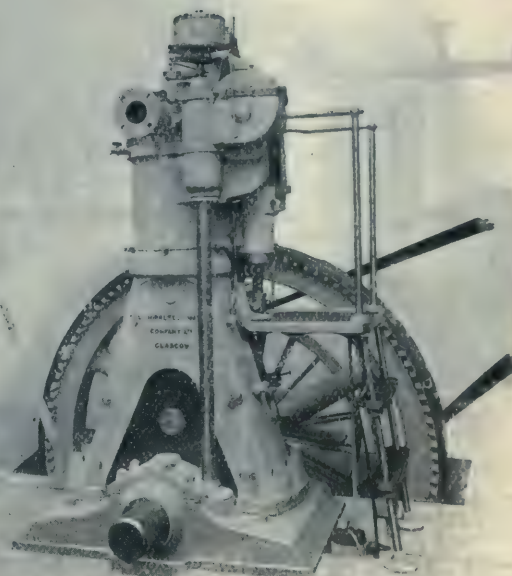
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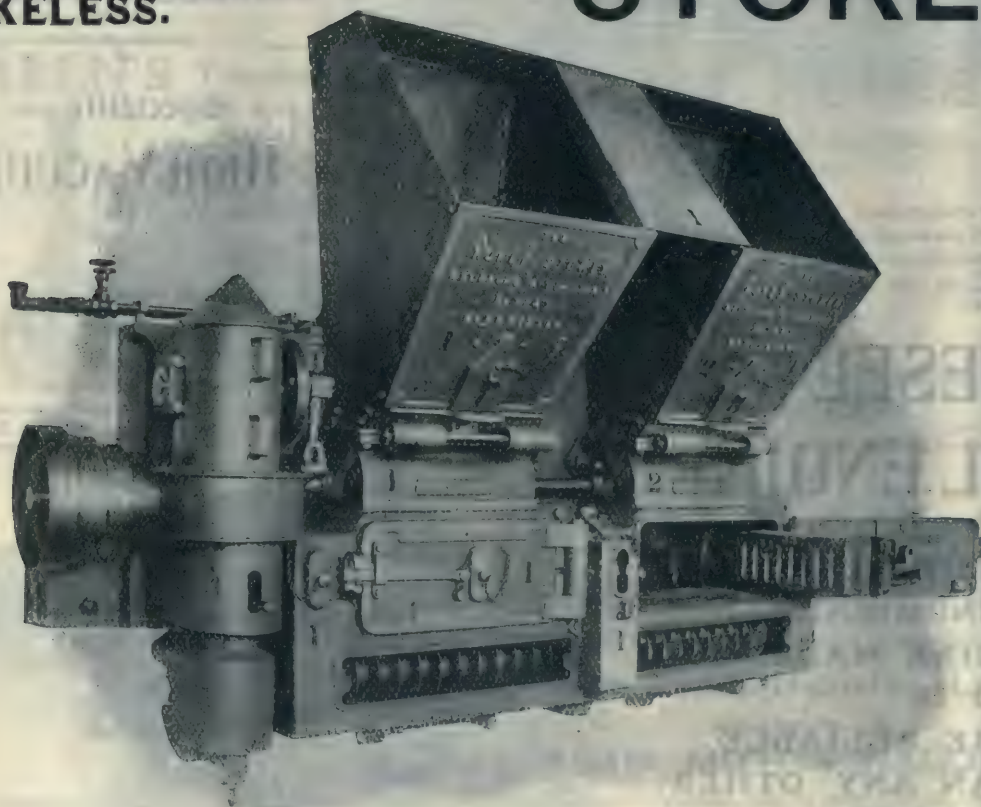
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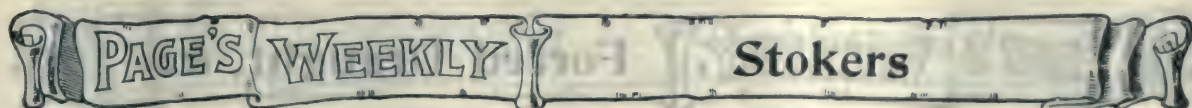


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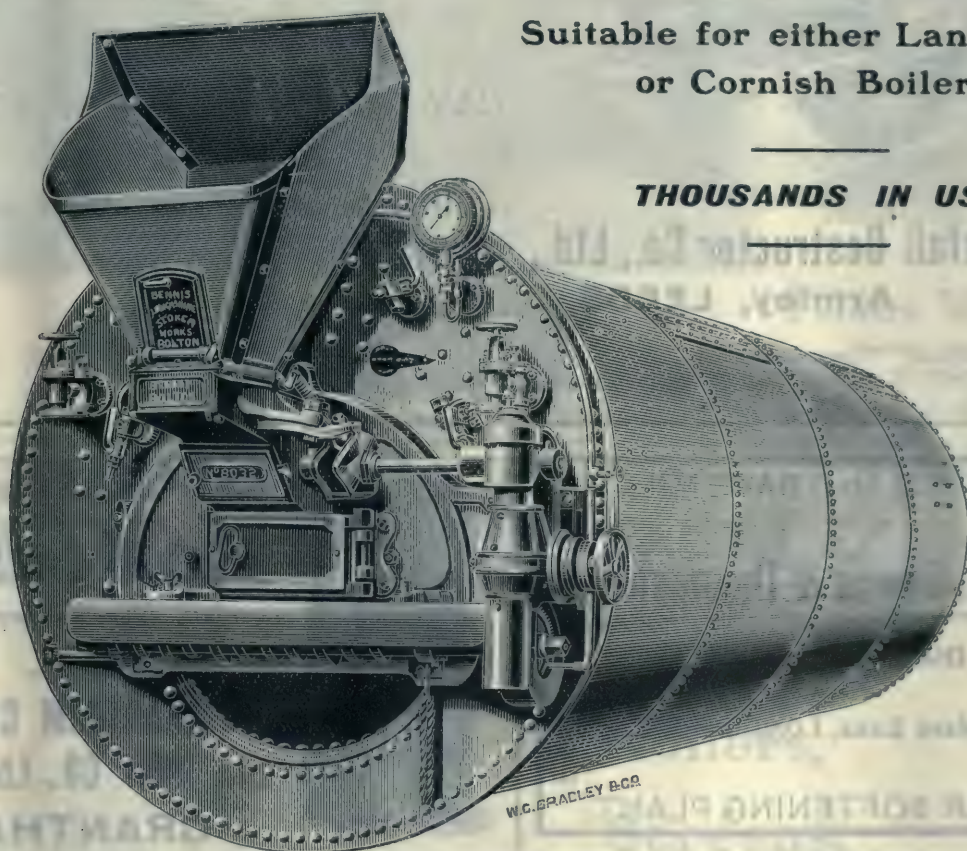


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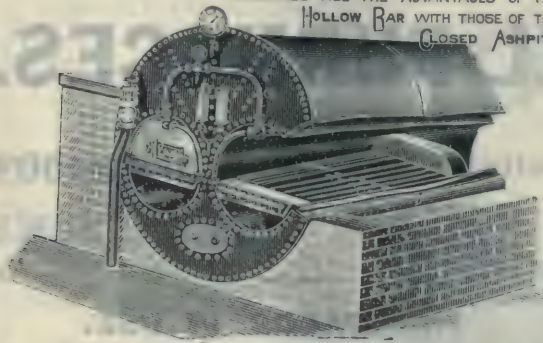
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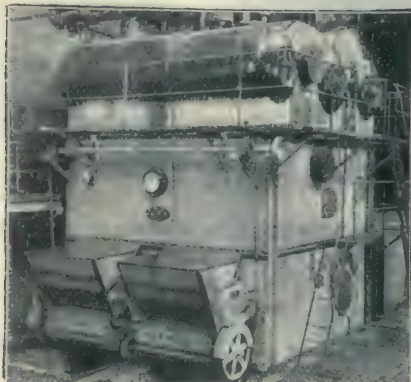


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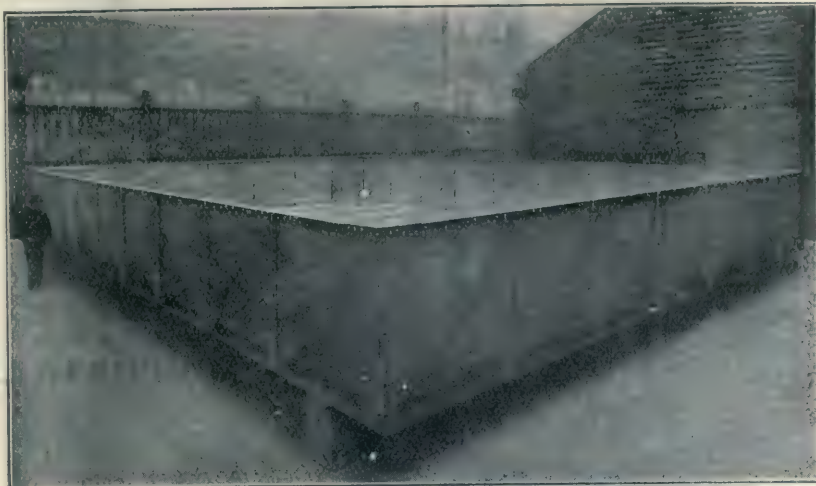
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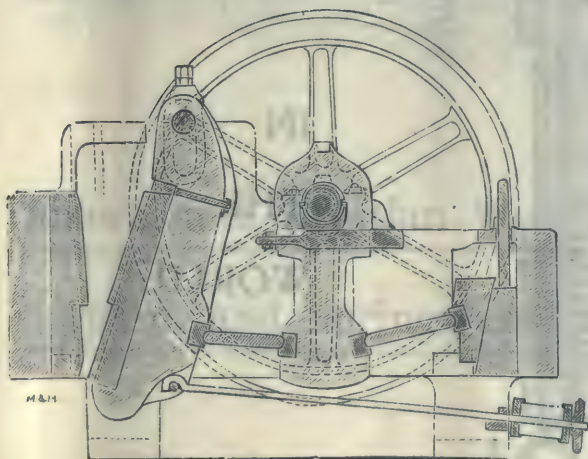
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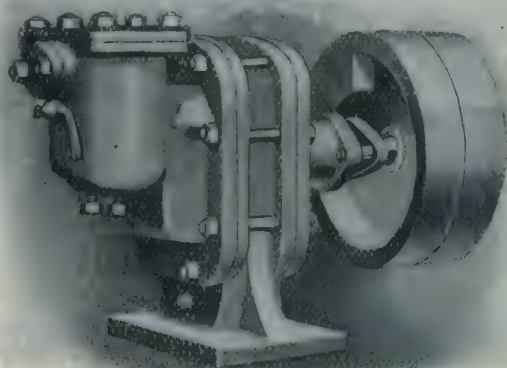
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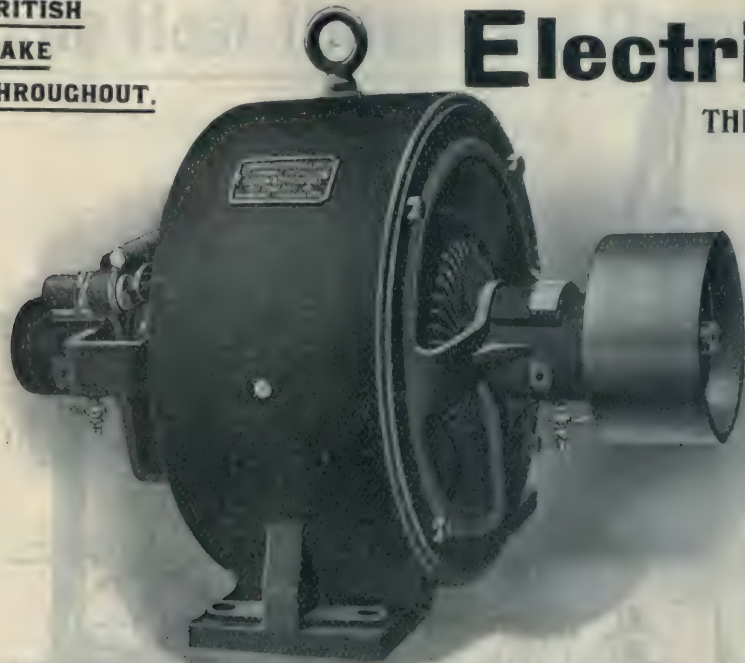
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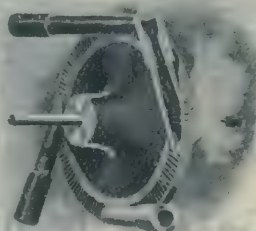
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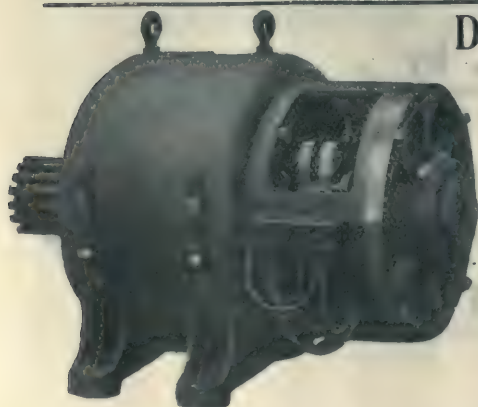
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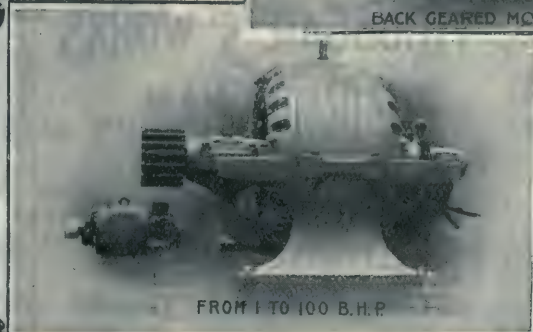
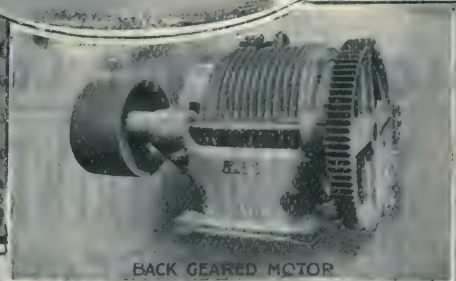
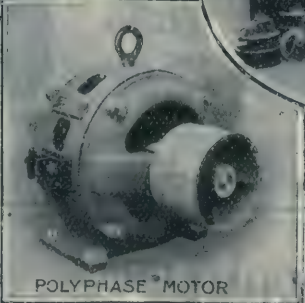
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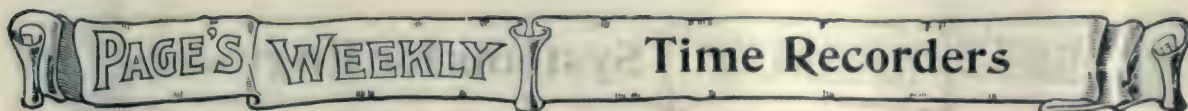


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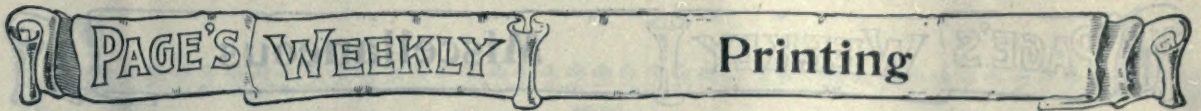


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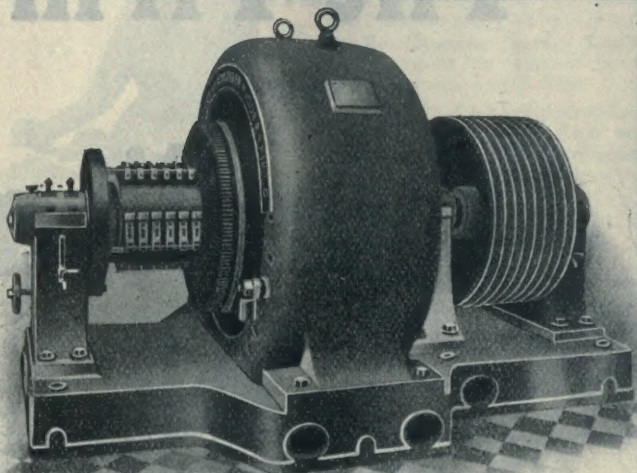
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Miscellaneous

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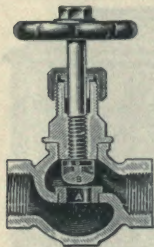
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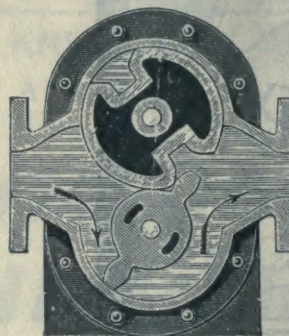
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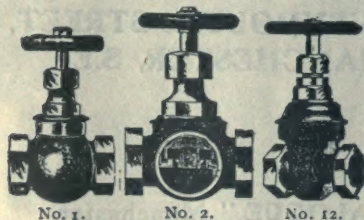
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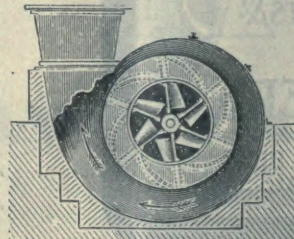
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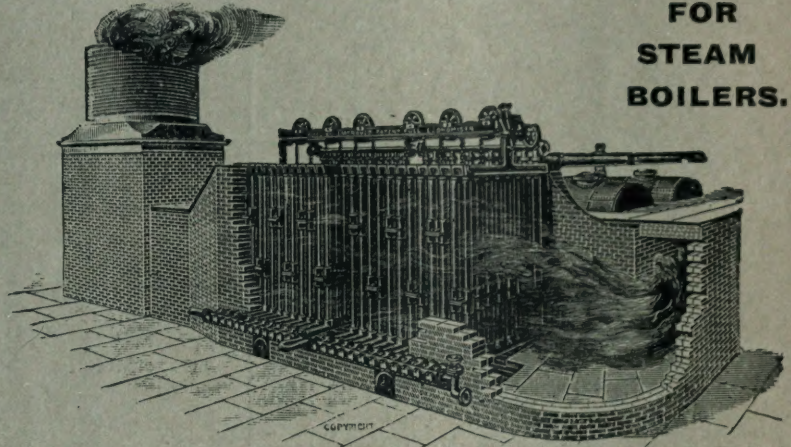
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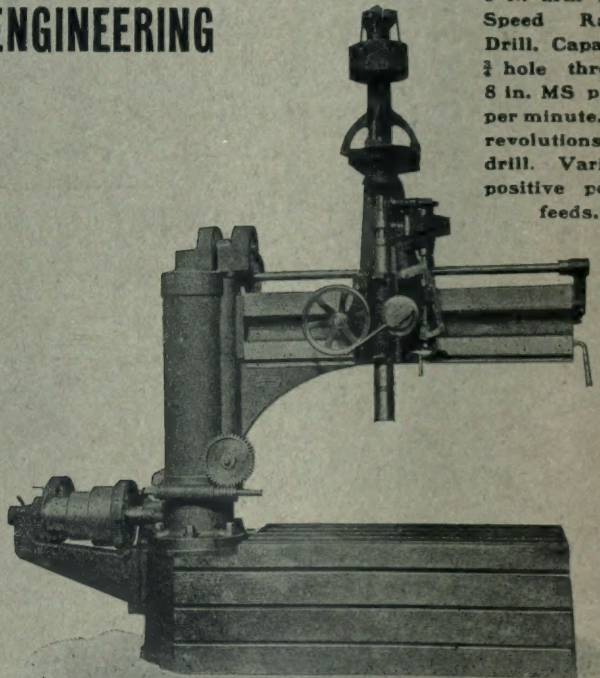
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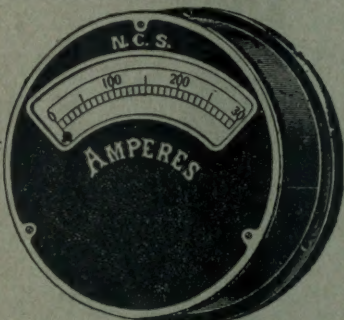
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